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1.2 PROJECT REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specifications sections, apply to this Section.

B. The work to be performed without limiting the generality thereof, consists of furnishing all labor, materials, and equipment required for construction of the work described in these specifications.

C. The General Scope of Work: The scope of work includes, but is not limited to, the following: Demolition and Removal: This involves the selective demolition and removal of portions of an existing section located on the second level of the library building. The work includes the removal of abandoned materials, components, and select interior finishes currently installed. New Construction: The project requires reconstruction of the affected area as per the design, ensuring that the new work is seamlessly integrated with the existing structure. The transition between the new and existing work must be flawless and free of imperfections. MEP/FA System Upgrades: In addition to general construction, upgrades to the existing Mechanical, Electrical, Plumbing, and Fire Alarm (MEP/FA) systems are included as specified in the construction documents. All work must be completed in accordance with the provided plans, specifications, and applicable standards to maintain the functionality and aesthetic integrity of the library.

D. The Contractor shall visit the site and thoroughly acquaint themselves with all existing conditions pertaining to this work. No claim for extra compensation will be entertained for the work required to be done which preliminary examination of the site would have revealed as necessary to accomplish the purpose intended as outlined-in the drawings and specifications.

E. If the Contractor does NOT achieve the substantial completion date as identified within the contract document, they shall be required to work premium time which will be after hours at a time to be designated and continue to work until the contract is complete. The cost for premium time is at the contractor’s own expense. If the Owner is required to pay employee overtime or any other payments to assist the contractor to carry out this premium time work, this cost will be documented and deducted from the final payment or retainage due to the contractor.

1.3 WORK BY OWNER

A. Items noted 'N.I.C.' (Not in Contract)' fixed and movable cabinetwork, furnishings, and minor equipment will be furnished and installed by Owner during or after Work under this contract.

1.4 CONTRACTOR USE OF PREMISES

A. Limit use of premises to allow:

1. Owner Occupancy

2. Work by Others and Work by Owner

3. Use of premises by public.

1.5 FUTURE WORK

A. Project is not affected by future work.

1.6 CASH ALLOWANCES

A. No cash allowance shall be included.

1.7 CONTINGENCY ALLOWANCE

A. Allow the stipulated sum of $12,500.00 for latent conditions, to be included in the general contractor's bid proposal.

B. Contractor's costs for Products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Allowance.

1.8 INSPECTION AND TESTING ALLOWANCES

A. Inspection and Testing will be provided by the General Contractor and paid for a part of this project's contract.

B. All testing must be performed by an independent testing agency. The successful contractor must submit the proposed testing agency to the architect for approval prior to any work being performed on the project. The Architect will have the authority and final decision on the selection of the testing agency.

C. Allow the stipulated sum of $2,500.00 to perform the required testing services, to be included in the general contractor's bid proposal.

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

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

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

a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

e. Security and protection of samples and test equipment at the Project site.

E. If placed material fails the required testing or conformance to the contract documents, the contractor shall be responsible for complete removal of the product and /or the material and replace with new work that conforms to the contract documents. Cost for the replacement of deficient or non-conforming work shall be the contractor's responsibility. Additional calendar days associated with this rework shall not increase the contract time.

1.9 SCHEDULE OF VALUES

A. Submit schedule of AIA Form G703. Contractor's standard form of electronic media printout will be considered.

B. Submit schedule of Values Pdf form within 15 days after date of Owner-Contractor Agreement or established in Notice to Proceed.

C. Schedule shall be completely itemized per section to allow for complete review of all values. This shall be neatly prepared, clean and precise. They shall be legible and orderly. Hand written documents **will not** be acceptable. The architect will refuse to review handwritten and illegible documents.

D. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.

E. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

1.10 APPLICATIONS FOR PAYMENT

A. Submit three copies of each application on AIA Form G702.

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

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

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

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

a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of Work covered by the application who could lawfully be entitled to a lien.

4. Waiver Forms: Submit waivers of lien executed in a manner, acceptable to Owner.

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

D. Payment Period: Monthly.

1.11 CHANGE PROCEDURES

A. Any/all additional work as "Asked for" by the Architect or the Owner (or owner representatives) will be verbally requested or submitted to the Contractor on a Request for Proposal AIA Document G 709 or written notice. Upon Acceptance and Negotiated Price the Contractor will Furnish to the Architect A Change Order AIA form G701.

B. No deviation shall be made from the contract documents as prepared by the Architect. If the contractor through no written directive from the Architect allows or performs changes in the work, the contractor shall become completely liable for that portion of work which has been modified. The contractor shall bear all responsibility for this work including compliance to all Federal, State and local code compliance, additional project coordination and any associated financial obligation.

C. If the Owner makes a directive to the contractor for modifications to the plans without written approval from the architect, and the work is carried out, the Architect will become exempt from any liability from this work which may result in additional drawing, field modification or causes conflicts to other area which is a resultant from this change no matter how minor the change.

D. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.

1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.

2. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.

3. Lump sum change orders will not be accepted. Change orders must be itemized in detail.

4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

5. Comply with requirements in Section "Product Substitutions" if the proposed change in the Work requires the substitution of one product or system for a product or system specified.

E. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G714, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.

2. The Architect also has the right to verbally direct the contractor to perform additional or modification work from the contract documents.

a. If the work requested does not modify or alter the contract cost the contractor shall immediately begin the requested work

b. If the work requested will modify the contract price and the Architect accepts the cost proposal the contractor shall once again immediately implement the work requested.

c. If the architect is not in agreement with the contractor’s cost for the work requested, the contractor is to immediately move forward with the Architect’s verbal or written directive for the work, so as not to cause any delay to the project.

d. The Owner will hire a third party to perform an independent analysis of the associated cost for the additional work requested. This cost will be used to negotiate the final cost for the work requested.

F. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.12 ALTERNATES & CONTRACT LINE ITEMS

A. Alternates and line items quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option.

B. Provide all line-item cost and change in contract calendar days (if any) on the bid form. These items will be used to determine additional work being considered and to be incorporated within this project.

C. Coordinate related Work and modify surrounding Work as required.

D. Also include any additional calendar day(s) which may be necessary to complete the proposed work.

1.13 INSURANCE

A. Insurance requirements are as set forth in by the Owners bid documents.

1.14 COORDINATION

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

B. Supervisory Coordination: Construction is problem solving, therefor the general contractor is notified that their project supervisor and project superintendent who have been approved by the architect for this project will be required to provide for all necessary coordination for the work contained in the contract documents. Coordination is the

responsibility of the General Contractor, this is not limited to the contract documents, but extends to coordinate with all necessary utilities, state agencies, permitting requirements, applications and any other governing body that may be required under the construction for this project. Coordination of events rest solely with the General Contractor.

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

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

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

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

4. Verify utility requirements characteristics of operating equipment are compatible with building utilities.

5. 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.

6. Unless otherwise identified on the construction drawings, any and all piping, vents, drainage, waster, sprinkler, water supplies, drains etc. in all spaces shall be enclosed / encased and finished to match adjacent surface finish. If any of these areas require fire rating assemblies, an appropriately rated assembly shall be planned to match that of the adjacent wall or as recommended by the Architect.

7. Coordinate all construction requirements with the project representative personnel. Inform the architect and representative of all coordinated arrangements. Coordinate all required barriers before commencing any work.

8. Provide all coordination drawings and documentation.

D. Construction coordination and problem solving for furnishing a complete project per the design intent of the construction documents, shall be the responsibility of the contractor.

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

F. Coordinate space requirements and installation of mechanical and electrical work which are indicated on Drawings.

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

H. Coordinate all construction requirements with the owner. Inform the owner of all coordinated arrangements. Coordinate all required barriers before commencing any work.

I. Coordinate all work and approvals from all responsible parties involved within this project. Ensure that all approvals are received for all Town officials. Forward all correspondences and conversations to the Architect for record purpose.

1.15 FIELD ENGINEERING

A. Establish elevations, lines, and levels and certify that elevations and locations of the Work conform with Contract Documents, and matching all existing conditions, and necessary elevations.

1.16 CUTTING AND PATCHING

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

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

C. Refinish surfaces and damaged surfaces to match adjacent finishes, and repair or make new.

D. In any areas where penetrations are made from this construction, re-secure all openings, and patch accordingly to be neat and inconspicuous. If areas or openings require fire stopping or fire/smoke seal install accordingly. Keep caulking smooth, neat, and clean.

E. Cut existing concrete flooring where required and fire seal all penetrations.

F. All cutting, patching, work removed, replaced, reused and stored in the existing building. All material removed and not reused shall become the property of the Owner and shall be stored where directed or disposed of as required.

G. Demolition and removal shall be performed without damage to adjacent retained work; however, where such work is damaged, the Contractor shall patch, repair, or otherwise restore same to its original condition. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

H. Performance: Perform all work of fitting, adjustment, cutting, patching, finishing and restoration to perfectly match the quality as specified throughout these specifications.

1.17 CONFERENCES

A. Owner and Architect will schedule a preconstruction and site mobilization conference after Notice of Award for all affected parties.

B. When required in individual specification Section, convene a preinstallation conference at project site prior to commencing Work of the Section.

1.18 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at intervals, as deemed necessary by the Architect and Owner.

B. Preside at meetings, record minutes, and distribute copies within three days to those affected by decisions made.

C. Job meeting notes shall indicate job meeting number, date, day into construction, and remaining days left to complete construction.

1.19 SUBMITTAL PROCEDURES

A. The submittal process for the project is an integral check and balance for confirming the submission to the specified product and its installation. The process is also a team effort, as such, the contractor is advised that a thorough review of the contractor's or subcontractor's submittal is required by a competent construction savvy individual who pertains knowledge of the specification and can review the documentation with a thorough understanding of the specified product comparing the submitted documentation, with the specified item.

1. If the submittal reviews appear to be rubber stamped the architect will return the submittal as non-compliant expecting the contractor to perform their review responsibility.

B. Submittal form must identify Project, Contractor, Subcontractor or supplier; and pertinent Contract Document references, and correct division.

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

D. Contractor will be responsible for the complete and thorough review of all shop drawings and the conformance of these drawings with the contract documents. Drawing and literature received by the architect unstamped will not be reviewed. Submittals which appear to not have been reviewed will be rejected and immediately returned.

E. No product or material shall be installed in the project without the stamped conformed approval of the architect. Products installed in this project whether conforming or nonconforming without the architect's stamped approval will be ordered removed until all approvals are met at the expense of the contractor.

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

G. Where shop drawings require accurate detailing and clarity, these drawings shall be produced by an experienced architectural detailer. Unclear and poor-quality drawings shall be returned un-reviewed, and stamped rejected.

H. Where shop drawings are required for any submission under this bid package, the Architect's drawing will NOT be provided in any way to be used for the implementation for any shop drawing or submittal package. There will be no exception. The responsibility of an architectural submittal falls upon the bidder to comply.

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

J. All errors in shop drawings whether approved or not will be the contractor's responsibility.

K. Submittals shall be in electronic form in Pdf format. Submittals shall contain the contractor's stamp and all their mark-up/corrections based on their review. The architect will make a cursory review for compliance with the specified item and return to the contractor with the architect's affixed stamp. No submittal is valid without containing the architects' stamp.

1.20 SUBSTITUTIONS

A. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract. The contractor is cautioned that product substitution employs the burden of proof as an equal to be by the contractor with substantial written comparative evidence. All submissions shall be completely review by the contractor, otherwise they will be rejected, until the contractor follows the proper guidelines set forth within this specification

B. Substitution **WILL NOT** be allowed after the award of the contract. However, the architect may entertain substitutions if the contractor completely complies with this section. The architect is not obligated to approve any such substitution which he feels does not represent a complete equal to the product as he has specified.

C. Substitutions may be considered after the award of contract, when a Product becomes unavailable through no fault of the Contractor. However, this must be documented.

D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents. A request constitutes a representation that the Bidder:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the Substitution as for the specified Product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse Owner & Architect for review or redesign services associated with reapproval by authorities.

E. The contractor shall list substitutions on their bid form or in a formal proposal form at the time of their bid submission. This submission does not relieve the contractor from their obligation of the product as specified within the contract documents. If a product offers the Owner/Architect a cost savings this should be so indicated in their formal proposal. The architect is not obligated to accept the proposed substitution of a product that he feels is inferior to that as specified. The architect decision is final.

F. The Architect will consider requests for Substitutions only within 30 calendar days after date of Owner-Contractor Agreement or established in Notice to Proceed.

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

H. Submit three copies of Requests for Substitution for consideration. Limit each request to one proposed Substitution.

I. The burden of proof for such substitution shall be the contractor's responsibility. A substitution shall be granted only after the contractor has submitted a document listing both items and the characteristic of each item and how it identifies the product as an equal. This shall be a line-item comparison sheet.

J. This specification may indicate an approved equal to an item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company's negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission.

1.21 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within 15 days after date of Owner-Contractor Agreement for Architect review. Schedule shall be professional quality, legible and typed.

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 professional quality bar chart with separate line for each major section of Work or operation or section of Work, identifying first work day of each week.

1.22 CONSTRUCTION COMPLETION SCHEDULE

A. The completion of this project is paramount, and time is of the essence. The contractor is advised that completion of this project under the time frame set forth in these contract documents must be adhered to.

B. The contractor is reminded of any and all associated penalties for not achieving the stipulated completion date.

C. The contractor is advised that should the completion date not be achieved; it is important and required to open up portions of the project or facilities. Obtaining approval for this shall become the general contractor's responsibility. The contractor must obtain all necessary approval and direction from the local/state officials involved with this project's jurisdiction and authorized to approve all work for compliance with all state and or local codes requirements.

D. If the project does not achieve substantial completion to the satisfaction of the Architect, then the contractor and their subcontractors shall be required to complete the project on premium time and after the normal business day of the facility. This will not relieve them from the penalties to be assessed.

E. If for any reason the Architect or Owner stops a project through the fault of the contractor, the calendar days will continue to accrue.

1.23 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Owner-Contractor Agreement or Notice to Proceed, submit complete list of major Products proposed for use, with name of manufacturer, trade name, and model number of each Product.

1.24 SHOP DRAWINGS

A. Submit in Pdf form.

B. Product literature in color and actual color samples delivered to the Architect.

C. All drawings and literature shall be reviewed, corrected and stamped for conformance prior to submitting.

D. Where shop drawings require accurate detailing and clarity, these drawings shall be produced by an experienced architectural detailer. Unclear and poor-quality drawings shall be returned un-reviewed, and stamped rejected.

E. The Architect will reject any and all product data, drawings and submittals which have not been thoroughly reviewed by the contractor. It is the contractor’s responsibility to review all data, submissions and drawings before affixing their stamp of approval on the documents to be submitted to the architect. Documents having the appearance of not being thoroughly reviewed will be returned, delays by this action will be the contractor’s responsibility and financial burden.

1.25 PRODUCT DATA

A. Submit product information in the form of a Pdf for review by the architect.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer’s standard data to provide information unique to this project.

C. Printed color samples are NOT acceptable, actual color chip are required of all products.

1.26 SAMPLES

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

B. Submit samples of finishes from the full range of manufacturers' standard colors or in custom colors selected, textures, and patterns for Architect's selection.

1.27 MANUFACTURERS' INSTRUCTIONS

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

1.28 MANUFACTURERS' CERTIFICATES

A. When specified in individual specification Sections, submit manufacturers' certificate to Architect for review, 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.

1.29 QUALITY ASSURANCE/CONTROL OF INSTALLATION

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

B. Comply fully with manufacturers' instructions. It will be the contractor's responsibility to mandate to his crew and any/all subcontractors employed by the contractor the practice of incorporating all industry standards to ensure that the material being installed has been installed in the proper way as indicated by the manufacturer or proper industry standards. In all cases where conflicts occur between the contract document and product literature contract the architect for the final decision.

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

1.30 REFERENCES

A. Conform to reference standard by date of issue current as of date of Contract Documents.

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

1.31 FIELD SAMPLES

A. Not applicable.

1.32 INSPECTION AND TESTING LABORATORY SERVICES

A. The contractor shall employ the services of an independent firm to perform inspection and testing.

B. The cost for all testing shall be by the general contractor and included within the base bid.

C. The independent firm will perform inspections, tests, and other services as required.

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

E. Retesting required because of non-conformance to specified requirements will be charged to the Contractor.

1.33 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions and to initiate instructions when necessary.

B. Report observations and site decisions or instructions that are supplemental or contrary to manufacturers' written instructions.

1.34 TEMPORARY ELECTRICITY

A. Connect to existing power service. Power consumption shall not disrupt Owner's need for continuous service. If disruption occurs, this contractor shall provide other means of service at his expense. Owner to pay for power consumed.

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

C. Contractor shall follow all O.S.H.A. Requirements pertaining to power cords including the use of GFI outlets.

1.35 TEMPORARY LIGHTING

A. Project is NOT affected by temporary lighting. Existing light source can be used. If additional lighting is required to perform services this contractor shall provide the means to do so.

1.36 TEMPORARY HEAT

A. Not Applicable.

1.37 TEMPORARY VENTILATION

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, and gases. Ensure the building users are not affected from these elements.

1.38 TELEPHONE SERVICE

A. Provide, the Architect and project team with a cell number for the project contact individual.

1.39 TEMPORARY WATER SERVICE

A. Connect to existing water source for construction operations.

1.40 TEMPORARY SANITARY FACILITIES

A. Use of existing facilities will be permitted.

1.41 BARRIERS AND FENCING

A. Provide barrier and signage to prevent unauthorized entry to construction areas or to protect occupants from entering areas of potential danger or harm. Cordon off area to prohibit entry into work area. Protect work or construction area entry by all possible methods and means.

1.42 WATER CONTROL

A. Not Applicable

1.43 INTERIOR ENCLOSURES

A. Provide temporary full height partitions and closures as required to separate Work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner Occupied areas, and to prevent damage to existing materials and equipment.

B. Dust from cutting or construction work must be cleaned under this project. Protection to all room content and equipment will be paramount, and therefore the responsibility of the contractor. Damage or unacceptable conditions caused by this construction shall be made clean and acceptable to the Owner at the contractor's expense. If the contractor does not adhere to this requirement, the Owner shall take action to remediate the unacceptable condition and the contractor will be charge for these services.

1.44 PROTECTION OF INSTALLED WORK

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

1.45 SECURITY

A. Not Applicable.

1.46 ACCESS ROADS

A. Review parking and road access requirements with Owner

1.47 PARKING

A. Review parking with Owner to accommodate Construction personnel.

1.48 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition at all times.

1.49 FIELD OFFICE

A. Will not be required.

1.50 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Not Applicable.

1.51 SAFETY PROCEDURES

A. It will be the Contractor's responsibility to follow any and all safety regulations as required by OSHA, and all State & National Regulations. Such requirements will include the use of Safety Hat & Glasses, and other equipment.

B. This project requires compliance with any/all O.S.H.A. guidelines.

1.52 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. Products may also include

existing materials or components specifically identified for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by the contract documents.

C. Use interchangeable components of the same manufacturer for similar components.

1.53 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

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

B. Review storage area with the Owner prior to commencing work or storing any materials.

1.54 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

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

1.55 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.

D. Submit a written report that equipment or system has been properly installed and is functioning correctly.

1.56 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance or Products to the Owner two weeks prior to date of Substantial Completion inspection.

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

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

1.57 TESTING, ADJUSTING AND BALANCING

A. The Contractor shall pay for services of an independent firm to perform testing, adjusting and balancing.

B. Reports will be submitted by the independent firm to the Architect indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with the requirements of the Contract Documents.

C. Cooperate with independent firm; furnish assistance as requested.

D. Retesting required because of non-conformance to specified requirements will be charged to the Installation Contractor.

E. If reports are not complete and all balancing and operations unacceptable, **no payment** will be released until the general contractor is in compliance with this requirement, and the Owner has accepted the system as installed.

1.58 CONTRACT CLOSEOUT PROCEDURES

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

B. Submit to the Architect a punch list prepared by the project superintendent for review prior to requesting the architect to perform their punch list and inspection. The architect will not perform an inspection until they receive the written notice of compliance and the contractor's own generated punch list. The contractor shall also provide the architect with a disc enclosing the contractor's punch list to allow the architect to continue the document.

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

1.59 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean all surfaces exposed to view.

C. Clean light fixtures and mechanical equipment from all construction dust.

D. Clean debris from site or project area.

E. Clean or replace filters or operating equipment.

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

1.60 ADJUSTING

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

1.61 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of Contract Documents to be utilized for record documents.

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

C. Specifications: Legibly mark and record at each Product Section a description of actual Products installed.

D. Record Documents and Shop Drawings: Legibly mark each item to record actual construction.

E. Submit to architect weekly, the project supervisor's daily log and report.

F. Submit documents to Architect with claim for final Application for Payment.

G. The contractor is cautioned that failure to submit these documents and/or operation and manuals shall result in nonpayment of the final application and the release of any/all retainage.

1.62 OPERATION AND MAINTENANCE DATA

A. Submit two sets prior to final inspection, bound in 8 1/2 x 11 inches (216 x 279 mm) text pages, three-D slide ring binders with durable plastic 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 titling clearly printed under reinforced laminated plastic tabs.

D. Contents:

1. Directory, listing names, addresses and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
2. Operation and maintenance instructions, arranged by system.
3. Project documents and certificates.

1.63 WARRANTIES

A. Provide duplicate notarized copies.

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

C. Submit two sets of warranties, bonding, three D slide ring binders, labeled Warranties - with the project name in bold. Submit binder with final application for payment.

D. Submit prior to final Application for Payment.

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

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

1.64 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide Products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.

B. Deliver to project site or place in location as directed; obtain receipt prior to final payment.

1.65 WINTER CONDITIONS

A. Not Applicable.

1.66 MANDATORY CLEANING PROCEDURES FOR CONSTRUCTION AND RENOVATION WORK

A. When performing any remodeling or demolition work adjacent to occupied areas, it is the responsibility of the contractor or subcontractor to completely seal off the construction from the occupied area with an impervious barrier including above suspended ceilings to keep occupied areas free from dust, dirt, debris, fumes, or any foreign matter not common to the occupied space.

B. The contractor or subcontractors will use mechanical exhaust piped to the outside when engaged in work involving drilling, sawing, sanding, sand blasting, demolition, cleaning, painting, while working in or around office areas and any occupied areas.

C. All HVAC systems including duct work within a construction area are to be completely sealed up, turned off, locked out, before any drilling, sawing, sanding, sand blasting, demolition, cleaning, painting, or similar work takes place.

D. The use of hepa vacuum's are mandatory in any cleaning of construction areas, under no circumstances will dry sweeping (including the use of sweeping compounds) be permitted by any contractor or subcontractor.

E. All barriers will be maintained until the construction area is completely cleaned and free from dust, debris, and is ready for occupancy. If barriers must be removed to complete certain work, then the work must be completed when there is no one using the occupied area and the area has to be completely cleaned prior to employees being allowed back into the work space.

F. Any work involved in removing ceiling tiles, no matter what the incident or work, will be allowed under the following criteria:

1. All common areas and hallways are to be cordoned off completely and securely so access is limited to workers only while work is in progress with renewed access to the area when completely clean and put back to the original state.

2. Extreme care is to be used during demolition work or the use of loud equipment in any occupied or adjacent work areas.

G. All possible attempts must be made to keep construction and employee areas separated to ensure the health and safety for everyone involved including any disruption to their operations.

H. The Architect or Owner or their representative will stop any work immediately that is not conforming to good house cleaning and work place practices or deviating from previous stated procedures until such time as the problem is resolved.

1.67 SAFETY REQUIREMENTS

A. It is a requirement of this project to follow all OSHA Regulations regarding Job Site Safety. All work people will be required to wear protective eye wear and hard hats at all times. Safety must be strictly enforced.

B. All safety issues will be strictly enforced and nonconforming will not be tolerated by anyone working within this project.

1.68 EQUIPMENT REQUIREMENTS

A. All tools and equipment being used shall be of the type which employs the use of a self-contained bag to house the discharge of dust and particles.

1.69 NOISE CONTROL

A. All personnel employed by the Contractor and those of which are employed by the Owner must maintain the use of proper business practice, fowl language, yelling and disruptive behavior will not be tolerated.

B. All major demolition and equipment which in the opinion of the Owner/Architect which eminent a disruptive noise and may cause discomfort to the tenants are required to be performed with extreme care and alternating intervals.

1.70 SECURE VENTILATION, LIGHTING & EQUIPMENT

A. The Contractor will be required to block up or securely cover all duct work, lights, equipment, both new and used during the installation of existing or new equipment.

1.71 INSPECTIONS

A. The contractor shall be responsible and liable for obtaining all approvals and inspection from the local or governing authority. The contractor is also required to abide by the local inspectors' requirements for inspections and the time requirement for these inspections. The failure of the contractor to obtain these approvals or inspections shall result in delay of payment and responsibility for any/all associated penalties levied by the town/city/inspector. This also includes any stop work order resulting from the inspectors, to also include penalties for project delay thru liquid dated damages.

B. No area whether ceilings, walls, floors shall be enclosed (including items with accessibility) without the inspection of the architect or related fields, in electrical, mechanical and/or structural engineering. Prior to preparation to close the contract or shall provide the architect with a minimum of 72 hours notice to allow the architect and his subcontractor to review all work.

1.72 SMOKE FREE PROJECT

A. This project area is a smoke free area.

1.73 SPECIAL INSTRUCTIONS

A. If through the course of this project the Contractor discovers asbestos material, lead paint, or any other material of questionable origin, they shall cease all work within the area notify Owner/Architect and all appropriate State and Local authorities of their discovery and await written direction on a procedure.

1.74 PERMITS

A. The successful contractor shall be required to obtain all required permitting for this project, and all required Town and State approvals and review of the construction documents. The cost of all reviews and permits shall be paid by the contractor and included within the contract base bid. The contractor shall be advised that this project is within the jurisdiction of the State of Rhode Island.

1.75 BONDS

A. Secure all bonds as required and identified with the contract documents.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

WAIVER OF LIEN FORM
MATERIAL OR LABOR

Construction Project:_____

General Contractor:_____

Subcontractor/Supplier:_____

Application and Certificate for Payment Number:_____
(prior to Application No. accompanying this Form)
Schedule of Values ITEM NO. : _____

DESCRIPTION OF WORK heading:_____

Total Payment Received,
Including Current Payment: $_____

Total Percentage Paid, Including Current Payment: _____%

The undersigned Representative of the above Subcontractor/Supplier has been contracted by the above General Contractor to furnish labor or materials, or both, as included in the approved Schedule of Values under the above line ITEM NO. and DESCRIPTION OF WORK heading, for the above Construction Project.

The undersigned acknowledges receipt of payment, under this line ITEM NO. and DESCRIPTION OF WORK heading, and hereby waives and releases any and all lien, or claim or right to lien, on the above Construction Project and premises under the statutes of the State of Rhode Island, relating to Mechanics Liens, on account of labor or materials, or both furnished, or which may be furnished, by the undersigned to, or on account of the above numbered Application and Certificate for Payment.

Signed on this _____th day of _____, 202__.

_____ _____
(signature) (firm name)

NOTARY NOTARY SEAL

_____

(Signature)

Commission on _____

END OF WAIVER OF LIEN FORM

SECTION 02 07 20

MINOR DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Removal of designated building equipment and fixtures.

B. Removal of designated construction, walls, doors, windows and components.

C. Identification of utilities.

D. Temporary partitions to allow building occupancy.

E. Review & coordinate with Environment Specialist, and Abatement Company all areas of work.

F. Coordination and location of dumpster for the construction operation.

1.03 RELATED SECTIONS

A. Section 01 00 10 – General Requirements.

1.04 SUBMITTALS

A. Submit demolition and removal procedures and schedule under provisions of Division 1.

B. Indicate areas for demolition, removal sequence and location of salvageable items.

1.05 PROJECT RECORD DOCUMENTS

A. Submit record drawings under provisions of Division 1.

B. Accurately record actual locations of all installed equipment.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition work, safety of structure, dust control and disposal of debris.

B. Obtain required permits from authorities.

C. Notify affected utility companies before starting work and comply with their requirements.

D. Coordinate all work with the requirements as set forth by the Abatement Company & Environmental Specialist.

E. Do not close or obstruct egress width to exists.

F. Do not disable or disrupt building fire or life safety systems without 5 day (minimum) prior written notice to the Owner.

G. Conform to procedures applicable when discovering hazardous or contaminated materials.

1.07 EXISTING CONDITIONS

A. Conduct demolition to minimize interference with adjacent building areas. Maintain protected egress and access at all times.

B. Provide, erect, and maintain temporary barriers and security devices.

C. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Owner's Representative prior to start of work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PREPARATION

A. Provide, erect and maintain temporary partitions to prevent spread of dust, fumes, noise, security and smoke to provide for Owner occupancy as specified in Division 1.

B. Protect existing items which are not indicated to be altered, demolished or removed.

C. Disconnect, remove and cap utility services within demolition areas.

D. Mark location of disconnected utilities. Identify and indicate capping locations on Project Record Documents.

E. Prevent movement of structure; provide, required bracing and shoring.

F. Protect lower floor areas from any damage.

3.02 EXECUTION

A. Demolish in an orderly and careful manner. Protect existing building, employees, and employer.

B. Except where noted; otherwise, immediately remove demolished materials from site and floor area.

C. Relics, antiques and similar objects remain the property of the Owner. Notify Architect prior to removal and obtain acceptance regarding method of removal.

D. Remove materials to be reinstalled or retained in manner to prevent damage. Store and protect under provisions of Division 1 and related sections.

E. Remove indicated materials and/or equipment to be retained by the Owner. Deliver to a location agreed upon.

F. Keep dumpster free from overfill and debris left on or around ground area.

3.03 CLEANUP AND REPAIR

A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas vacuum cleaned.

1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

3.04 SECURITY

A. At the end of each day or upon the completion of work at any time, the contractor is to provide complete security to the entire construction project, from possible vandalism, or forced entry to the building. Any and all necessary precautions shall be made to protect the existing area from entry.

END OF SECTION

SECTION 05 40 00

METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Metal stud wall framing and metal channel ceiling framing.

B. USG area separation wall system.

1.3 RELATED SECTIONS

A. Section 06 00 01 - Carpentry Work: Wood blocking and framing.

B. Section 07 21 16 - Batt and Blanket Insulation.

C. Section 08 12 00 - Standard Steel Frames.

D. Section 09 90 00 - Painting.

E. Section 09 81 16 – Interior Partition Insulation.

1.4 REFERENCES

A. ANSI/ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.

B. ANSI/ASTM C630 - Water Resistant Gypsum Backing Board.

C. ANSI/ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.

D. ANSI/ASTM C646 - Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gage Steel Studs.

E. ANSI/ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water-Resistant Backing Board.

F. ANSI/ASTM E90 - Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

G. ANSI/ASTM E119 - Fire Tests of Building Construction and Materials.

H. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for light Frame Construction and Manufactured Housing.

1.5 QUALITY ASSURANCE

A. Applicator: Company specializing in the erection of Gypsum Board Steel Studs work with 3 years documented experience.

B. Quality installation and install in strict accordance with all manufacturing written instruction and conformance to applicable code and industry standards.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assemblies.

1. Fire Rated Partitions: Listed assembly by UL as indicated on Drawings.

2. Fire Rated Ceiling: Listed assembly by UL as indicated on Drawings.

3. Fire Rated Structural Beam and Column Framing: Listed assembly by UL as indicated on Drawings.

1.7 SUBMITTALS

A. Submit under provisions of Division 1.

B. Shop Drawings: Indicate special details associated with fireproofing, acoustic seals, and fire ratings.

C. Submit manufacturer's installation instructions.

D. This specification may indicate an approved equal to an item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - GYPSUM BOARD SYSTEM

A. United States Gypsum Company.

B. Substitutions: Under provisions of Division 1.

2.2 FRAMING MATERIALS

A. All studs and/or joists and accessories shall be made of the type, size, gauge and spacing shown on the drawings - ASTM C645, with flange edges of studs bent back 90 deg and doubled over to form 3/16" minimum lip (return) and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth.

B. All structural members shall be designed in accordance with American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Members" 1986 edition.

C. All structural members shall be formed from corrosion resistant steel, corresponding to the requirements of ASTM A446, with a minimum yield strength of 40 ksi (50 ksi) (33 ksi) for SJ studs and Grade A, 33 ksi, for CR runners.

D. All structural members shall be zinc coated meeting ASTM A525.

E. All framing shall extend to the deck or the structure to ensure each space receives full height framing, acoustical insulation and sheetrock to prevent sound transmission into adjacent spaces.

F. Studs and Tracks: ANSI/ASTM C645; galvanized sheet steel, 20, 18, 16 gage thick or as indicated on Drawings, 'C' shape, with seriated faces. In areas where studs are attached to decks, all studs top plates shall have a slip connection.

1. Depth: 3 5/8" inches where indicated.

2. Depth: 4" inches where indicated.

3. Depth: 6" inches where indicated.

4. Or as indicated on drawings.

G. Furring, Framing and Accessories: inclusive of all required joints, trims and finished trims ANSI/ASTM C645.

1. Depth: 7/8" - hat-shaped.

H. Z-Furring Members: Manufacturer's standard zee-shaped furring members with slotted or non-slotted web, fabricated from hot-dip galvanized steel sheet complying with ASTM A 525, Coating Designation G60; with a minimum base metal (uncoated) thickness of 0.0179 inch, face flange of 1 1/4" wall-attachment flange of 7/8 inch, and of depth required to fit insulation thickness indicated.

I. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved, complying with the recommendations of gypsum drywall manufacturers for applications indicated. ANSI/ASRM C646.

J. Adhesive: ANSI/ASTM C557.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Beginning of installation means acceptance of existing surfaces.

3.2 METAL STUD INSTALLATION

A. Install studding in accordance with ANSI/ASTM C754 and GA 201 and GA 216. Studs to be screwed at **4 sides.**

B. Metal Stud Spacing: 16 inches on center or as indicated on drawings.

C. Partition Heights: Full height to floor or roof construction above. Install additional bracing for partitions extending above ceiling.

D. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.

E. Blocking: Screw wood blocking and/or plywood blocking to studs; bolt or screw steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinet toilet accessories, hardware and shelves.

F. Fastening: Fastening of components shall be with self drilling screws or welding. Screws and welds shall be of sufficient size to ensure the strength of the connection. Wire tying of components shall not be permitted. All welds shall be touched-up with a zinc rich paint.

G. Splices: Splices in framing components, other than runner track, shall not be permitted.

H. Abutting: Abutting lengths of runner shall be buttwelded, spliced or each length securely anchored to a common structural element. Runners shall be securely anchored to the supporting structure as shown on the drawings.

I. Bracing: Temporary bracing, where required, shall be provided until erection is complete.

J. Coordinate installation of bucks, anchors, blocking, electrical and mechanical work placed in or behind partition framing.

K. Install all full height walls with a slip connection.

3.3 WALL FURRING INSTALLATION

A. Erect wall furring for direct attachment to concrete, concrete block walls, and columns.

B. Erect furring channels vertically. Secure in place on alternate channel flanges at maximum 16 inches on center.

C. Space furring channels maximum 16 inches on center, as indicated on drawings, not more than 4 inches from floor and ceiling lines.

D. Install thermal insulation vertically and hold in place.

E. Erect free-standing metal stud framing tight to concrete and concrete masonry walls, attached by adjustable furring brackets in accordance with manufacturer's instructions.

3.4 FURRING FOR FIRE RATINGS

A. Install furring as required for fire resistance ratings indicated.

B. Laterally brace entire suspension system.

3.5 CEILING FRAMING INSTALLATION

A. Install in accordance with GA 201 and GA 216.

B. Coordinate location of hangers with other work.

C. Install ceiling framing independent of walls, columns, and above-ceiling work.

D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.

E. Laterally brace entire suspension system.

3.6 ACOUSTICAL ACCESSORIES INSTALLATION

A. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

B. Install acoustical sealant within partitions in accordance with manufacturer's instructions.

C. Install resilient channels at maximum 16 inches on center as indicated on Drawings. Locate joints over framing members.

D. Install acoustical caulking at all ceiling and soffit intersection with sheetrock, throughout.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Wood Framing General Notes, Sections, Plans, Typical Details, and other notes indicated on the architectural and structural drawings. In cases of conflict, information indicated on the structural drawings shall govern.

1.2 SUMMARY

A. Types of work in this section include the following:

1. General wood framing.
2. Framing with dimension lumber.
3. Framing with engineered wood products.
4. Plywood backing panels. Nails, bolts, and fasteners for securing items of rough carpentry.
5. All other rough carpentry items, as required and not otherwise specified, to complete the Work, are to be furnished and installed under other trade sections of the Specifications.
6. Wood blocking for toilet accessories, shelving, handrails, cabinets, equipment, fixtures and owner furnished item.
7. Wood grounds, nailers, blocking and curbs (integral kitchen cabinet base cove).
8. Wood furring.

B. Finish carpentry is specified in another section within Division 6, if applicable.

1.3 DEFINITIONS

A. Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed except as otherwise indicated.

B. This Section may include materials that may not be applicable to this project; however it provides these additional materials should the project scope be modified, changes or other work requested. It is left in this section for general and informational purposes.

C. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NLGA: National Lumber Grades Authority.

1.4 RELATED SECTIONS

A. Section 05 40 00 - Metal Framing

B. Section 09 29 00 - Gypsum Board System

C. Section 10 28 00 - Toilet and Bath Accessories

D. Section 12 30 00 - Prefinished Cabinets and Casework

E. All other sections as may be required.

1.5 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

B. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, installation and finishing of treated material.

1. Preservative Treatment: For each type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.

2. For water-borne treatment, include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.

3. Fire-Retardant Treatment: Include certification by treating plant that treated material complies with specified standard and other requirements.

4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

D. Certification of Wood Preservative Treatment: Submit certificate stating name of preservative used, retention in pounds per cubic foot of lumber treated; certifying that the treated material conforms to paint ability, drying time, and surface deposit requirements of Fed. Spec. TT-W-550 and TT-E-571. For water-borne preservative treated materials, verify that the moisture content upon shipment from the treatment plant does not exceed 15%.

E. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.

2. Engineered wood products.

3. Oriented strand board products.

4. Power-driven fasteners.

5. Expansion anchors.

6. Metal framing anchors.

F. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.6 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

1.7 DELIVERY STORAGE AND PRODUCT HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

B. For lumber and plywood pressure treated with water-borne chemicals, sticker between each course to provide air circulation.

C. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

1.8 PROJECT CONDITIONS

A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Lumber Standards: Manufacture lumber to comply with DOC PS 20" American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content of time of surfacing, and mill.

C. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.

2. Provide lumber with 15 percent maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

2.2 DIMENSION LUMBER

A. For light stud framing provide "Stud" or "Standard" grade lumber (2" to 4" thick, 2" to 6" wide, 101" and shorter), and standard grade for other light framing (2" to 4") thick, 2" to 4" wide) any species.

1. Non-structural Light Framing: Stress Group A (SPF); construction grade.

2. Studding and Blocking: Stress Group A (Hem Fir); stud grade.

B. Doulgas Fir Plywood: Sheathing, A-C grade, exterior glue.

C. Misc Fir Plywood: Sheathing, CDX grade, exterior glue.

D. Hardboard: Pressed wood fiber with resin binder, tempered grade.

E. Wood Particleboard: Composed of wood chips, shavings, or flakes, type made with high waterproof resin binders of grade to suit application; sanded faces.

2.3 BOARDS

A. Concealed Boards: Where boards will be concealed by other work, provide lumber of 19 percent maximum moisture content (S-DRY) and of following species and grade:

1. Redwood Construction Common per RIS Rules, Southern Pine No. 2 Boards per SPIB rules, or any species graded Construction Boards per WCLIB or WWPA rules.

B. Board Sizes: Provide sizes indicated, if not indicated, provide 1" x 8" boards.

2.4 MISCELLANEOUS LUMBER

A. Provide wood for support or attachment of other work including curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:

1. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

2. Provide all miscellaneous lumber to assist all trades where necessary to install the work to comply with the intent of the construction documents.

2.5 CONSTRUCTION PANELS FOR BACKING

A. Plywood Backing Panels for mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade designation, APA C-D PLUGGED EXPOSURE 1, in thickness indicated, or, if not otherwise indicated, not less than 15/32 inch. Painted black on all sides. Panel backing shall be neatly cut, square and sized to appropriately fit the equipment for which it is intended. ***(Do not use scrap material)***.

2.6 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

1. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

B. Nails, Wire, Brad, and Staples: RS FF-N-105.

C. Power Driven Fasteners National Evaluation Report NER-272.

D. Wood Screws: ANSI B18.6.1.

E. Lag Bolts: ANSI B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.8 WOOD TREATMENT BY PRESSURE PROCESS

A. Preservative Treatment: Where lumber or plywood is indicated as "Trt-Wd" or "Treated", or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.

1. Pressure-treated above-ground items with water-borne preservatives to comply with AWPB LP-2. After treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:

a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.

b. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

c. Wood framing members less than 18" above grade.

d. Wood floor plates installed over concrete slabs directly in contact with earth.

2. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment and to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.9 FIRE RETARDANT TREATMENT

A. Where fire-retardant treated wood ("FRTW") is indicated, pressure impregnate lumber and plywood with fire-retardant chemicals to comply with AWPA C20 and C27, respectively, for treatment type indicated below; identify "FRTW" lumber with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection or other testing and inspecting agency acceptable to authorities having jurisdiction.

1. Interior Type A: Use where "FRTW" wood is indicated for interior applications.

2. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

1. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.

2. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.

3. Countersink nails heads on exposed carpentry work and fill holes.

B. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.2 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS

A. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Provide concealed blocking for work under other sections at all locations where required for the secure attachment of items of work furnished and/or installed under the work of other sections. The contractor shall review all Sections of the Specifications and all the Drawings to determine the type and extent of items which require concealed blocking for attachment. Coordinate required size and location with the trades providing the items. Without limiting the extent of blocking required for the entire project, blocking shall be provided at the following locations as a minimum:

1. (1) 2 x 4 at each horizontal line of attachment for: Cabinets and Millwork, Toilet Accessories, Metal Lockers.

2. (1) 2 x 6 at each horizontal line of attachment for: Grab Bars, Handrails, Wall Hung Food Service Equipment, Wall Hung Plumbing Fixtures.

3.3 WOOD FURRING

A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.

1. Firestop furred spaces on walls at each floor level and at ceiling line of top story, with wood blocking or noncombustible materials, accurately fitted to close furred spaces.

B. Furring to Receive Plywood Paneling: Install 1 inch by 3 inch furring at 2 feet o.c. horizontally and vertically. Select furring for freedom from knots capable of producing bentover nails and resulting damage to paneling.

C. Furring to Receive Gypsum Drywall: Install 1 inch by 2 inch furring at 16 inches o.c. vertically.

3.4 WOOD FRAMING, GENERAL

A. Framing Standard: Comply with N.F.P.A. "Manual for House Framing" of National Design Specification for wood construction, unless otherwise indicated.

B. Framing with Engineered Wood Products: Install framing composed of engineered wood products to comply with manufacturer's directions.

C. Install framing members of size and spacing indicated.

D. Anchor and nail as shown, and to comply with the following:

1. National Evaluation Report No. NER-272 for pneumatic or mechanical driven staples, P-Nails, and allied fasteners.

2. Published Requirements of Manufacturer of Metal Framing Anchors.

3. "Appendix C-Recommended Nailing Schedule " of the International Building Code.

3.5 CLEANING AND PROTECTION

A. Clean all items thoroughly at completion of work under this section. Do not use any cleaning materials or methods that would affect later finishing where required.

B. Remove all tools, unused fasteners and accessories and debris created by this section from the site at the completion of each area of work.

C. It is the responsibility of this contractor to protect items installed by this section until time of acceptance by the Owner. Replace damaged or defaced items and repair or replace damaged or defaced adjacent surfaces, at NO cost to the Owner.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes joint sealants for the following locations:

1. Interior joints in vertical surfaces and horizontal non traffic surfaces as indicated below:

a. Perimeter joints of exterior openings where indicated.

b. Perimeter joints between interior wall surfaces and frames of interior doors.

c. Acoustical ceiling grid and wall surface.

d. Other joints as indicated, or required for protection.

1.3 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry System.

B. Section 06 10 00 - Rough Carpentry Work.

C. Section 09 29 00 - Gypsum Board System

D. All Sections as required.

1.4 REFERENCES

A. ANSI/ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

B. ANSI/ASTM D1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Form).

C. ASTM C790 - Use of Latex Sealing Compounds.

D. ASTM C804 - Use of Solvent-Release Type Sealants.

E. ASTM C834 - Latex Sealing Compounds.

F. ASTM C920 - Elastomeric Joint Sealants.

G. FS TT-S-001543 - Sealing Compound, Silicone Rubber Base.

H. SWI (Sealing and Waterproofers Institute - Sealant and Caulking Guide Specification.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.6 SUBMITTALS

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

B. Product data from manufacturers for each joint sealant product required.

C. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

D. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

E. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

F. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.7 QUALITY ASSURANCE

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

B. Installer Qualifications: Engage an experienced installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

C. Installer: Minimum three years documented experience, and approved by the Architect.

D. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

E. Conform to Sealant and Water proffers Institute requirements for materials and installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturers recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (44 deg C).

2. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.10 SEQUENCING AND SCHEDULING

A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

B. Coordinate work under provisions of Division 1.

C. Coordinate the work of this Section with Sections referencing this Section.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.12 WARRANTY

A. Provide five-year warranty under provisions of Division 1.

B. Warranty: Include coverage of sealants and accessories which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturers standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

B. Products: Subject to compliance with requirements, provide one of the products specified in each Elastomeric Joint Sealant Data Sheet.

2.3 LATEX JOINT SEALANTS

A. General: Provide manufacturers standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

C. Products: Subject to compliance with requirements, provide one of the following:

1. Acrylic-Emulsion Sealant:

a. "AC-20," Pecora Corp.

b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.

c. "Tremco Acrylic Latex 834," Tremco, Inc.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant: Manufacturers standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.

2. Product has flame spread and smoke developed ratings of less than 25 per ASTM E 84.

B. Acoustical Sealant for Concealed Joints: Manufacturers standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

C. Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant:

a. "SHEETROCK Acoustical Sealant," United States Gypsum Co.

b. "AC-20 FTR Acoustical and Insulation Sealant," Pecora Corp.

2. Acoustical Sealant for Concealed Joints:

a. "Pecora Corp.

b. "Tremco Acoustical Sealant," Tremco, Inc.

2.5 TAPE SEALANTS

A. Tape Sealant: Manufacturers standard, solvent-free, butyl-based tape sealant with a solids content of 100 percent formulated to be nonstaining, paintable, and nonmigrating in contact with nonporous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with a release paper on one side.

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

1. "Extru-Seal Tape," Pecora Corp.

2. "Shim-Seal Tape," Pecora Corp.

3. "PTI 606," Protective Treatments, Inc.

4. "Tremco 440 Tape," Tremco, Inc.

5. "MBT-35." Tremco, inc.

2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Open-cell polyurethane foam.

2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.

3. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.

4. Any material indicated above.

C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth. and otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer ASTM C804 for solvent release and ASTM C790 for latex base sealants and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturers recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 11 93 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

a. Do not leave gaps between ends of joint fillers.

b. Do not stretch, twist, puncture, or tear joint fillers.

c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer’s directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturers recommendations.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

B. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.6 ELASTOMERIC JOINT SEALANT DATA SHEET

A. BASE POLYMER: Urethane

B. TYPE: S-Single Component

C. GRADE: NS-Non-sag

D. CLASS:25

E. ADDITIONAL MOVEMENT CAPABILITY: 25**%**

F. USE RELATED TO EXPOSURE: NT

G. USES RELATED TO JOINT SUBSTRATES: NT, M, A, and as applicable to joint substrates Indicated, 0**.**

3.7 AVAILABLE PRODUCTS:

"Vulkem 230' Mameco International, Inc.

"Vulkem 921 " Mameco Intemational, Inc.

"Vulkem 116" Mameco International, Inc.

"Dynatrol" Pecora Corp.

"Permapol RC-1" Products Research and Chemical Corp.

"Sikaflex-la" Sika Corp.

"Sikaflex-15LM" Sika Corp.

"Sonolastic NP 1" Sonnebom Building Products Div., Rexnord Chemical Products, Inc.

"Dymonic" Tremco, Inc.

END OF SECTION

SECTION 08 11 12

STANDARD STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following products manufactured in accordance with SDI Recommended Standards:

1. Doors: Seamless, composite construction standard steel doors for exterior and interior use.

2. Frames: Pressed steel frames for doors, transoms, sidelights, mullions, interior glazed panels, and other interior and exterior openings of following type:

a. KD type frame

b. Rated and non-rated steel frames

3. Assemblies: Provide standard steel door and frame assemblies as required for the following:

a. Thermal rated (insulated).

4. Provide factory primed doors and frames to be field painted.

B. Painting primed doors and frames is specified in Division 9 Section "Painting."

C. Door hardware is specified in another Division 8 Section.

1.3 RELATED SECTIONS

A. Section 05 40 00 - Metal Framing

B. Section 08 21 10 - Wood Doors

C. Section 08 71 00 - Door Hardware

D. Section 08 80 00 - Glazing

E. Section 09 90 00 - Painting: Field painting of frames.

1.4 REFERENCES

A. ANSI A117.1 - Specifications for making buildings and facilities accessible to and usable by Physically Handicapped People.

B. ANSI/SDI - 100 Standard Steel Doors and Frames.

C. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. ASTM E152 - Methods of Fire tests of Door assemblies.

E. DHI - Door Hardware Institute: The installation of commercial steel doors and steel frames, insulated steel doors in wood frames and builders' hardware.

F. NFPA 80 - Fire doors and windows.

G. NFPA 252 - Fire tests for door assemblies.

H. UL 10B - Fire tests of door assemblies.

I. ADA - American with Disabilities Act.

1.5 SUBMITTALS

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

B. Product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, profiles, and finishes.

C. Shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

D. For door and frame assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer's certification that each assembly has been constructed to conform to design, materials and construction equivalent to labeled construction requirements.

E. Manufacturer's certificate certifying that products meet or exceed specified requirements.

F. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non-conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.6 QUALITY ASSURANCE

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications Standard Steel Doors and Frames" ANSI/SDI-100 and ANSI A117.1 and as herein specified.

1.7 QUALIFICATIONS

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

1.8 REGULATORY REQUIREMENTS

A. Fire Rated Frame and Doors to Conform to ASTM E152, NFPA 252 and UL 10B.

B. Installed Frame and Door Assembly: Conform to NFPA 80 for fire rated class same as fire door.

C. Conform to requirements of Rhode Island State Building Code, ADA and ANSI A117.1 for handicap requirements.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings and instructed by the manufacturer.

1.10 COORDINATION

A. Coordinate Work under provisions of Division 1.

B. Coordinate the work with door and frame opening construction, and hardware installation.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames, and as specified in Division 1.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inches spaces between stacked doors to promote air circulation.

1.12 WARRANTY

A. Provide warranties under provisions of Division 1 to the following terms:

1. Life of installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide standard steel doors and frames by one of the following:

B. Standard steel doors and frames:

1. Curries Company.

2. Steelcraft Manufacturing Co.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

C. Supports and Anchors: Fabricate of not less than 18-gage sheet steel; galvanized where used with galvanized frames.

D. Inserts, Bolts, and Fasteners: Manufacturers standard units. Where items are to be built into exterior walls, hot-dip galvanize in compliance with ASTM A 153, Class C or D as applicable.

E. Shop Applied Paint: Apply after fabrication.

1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints complying with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames."

2.3 DOORS

A. Provide metal doors to meet ANSI/SDI-100, Grade 111, extra heavy-duty, Model 4. Fabricate doors of 16-gage cold-rolled steel.

B. Flush seamless doors - 1 3/4" fabricate from two sheets of 16-gauge steel (ASTM A366) or A60 galvanized steel. No visible seams shall occur on door faces or edges.

C. Door edges shall be continuously welded, filled and ground.

D. Door to be internally reinforced with 22-gauge steel stiffeners and sound deadened with impregnated Kraft honeycomb core completely filling inside of the door and laminated to the inside faces of panel.

E. Door shall be mortised and adequately reinforced for all hardware.

F. Door shall be reinforced internally with a 14 gauge steel reinforcement for door closers.

G. Door shall be phosphatized and receive one cost of baked on prime paint.

H. Door styles as shown on plans. Provide complete shop drawing as indicated.

I. Provide lock blocks at lock edge and top of door for closer hardware reinforcement.

2.4 FRAMES

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 14-gage cold-rolled steel.

1. Frames type to be Knockdown with Precision fit interlock corners.

a. All interior office doors.

b. Equal rabbet design

B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

C. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.

D. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.

2.5 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in Manufacturers plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with ANSI/SDI-100 requirements.

1. Internal Construction: Manufacturer's standard polyurethane, polystyrene, unitized steel grid, vertical steel stiffeners, or rigid mineral fiber core with internal sound deadener on inside of face sheets where appropriate in accordance with SDI standards.

2. Clearances: Not more than 1/8 inch at jambs and heads except between non-fire-rated pairs of doors not more than 1/4 inch. Not more than 3/4 inch at bottom.

B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel.

E. Fabricate exterior doors, panels, and frames from galvanized sheet steel in accordance with SDI-1 12. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gage inverted steel channels.

F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

G. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236 or ASTM C 976 on fully operable door assemblies.

1. Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.41 Btu/(hr x sq ft x deg F.) or better.

H. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI Al 15 Series Specifications for door and frame preparation for hardware.

1. For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable.

I. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at project site.

J. Locate hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builders Hardware on Standard Steel Doors and Frames," published by Door and Hardware Institute.

K. Shop Painting: Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

1. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.

2. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify frame opening conditions under provisions of Division 1.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerances for size or alignment.

3.2 INSTALLATION

A. General: Install standard steel doors, frames, and accessories in accordance with final shop drawings, manufacturers data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames," unless otherwise indicated.

1. Except for frames located at existing concrete, masonry or drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-1 00.

1. Install fire-rated doors with clearances as specified in NFPA Standard No. 80.

D. Coordinate with masonry and wallboard wall construction for anchor placement.

E. Coordinate installation of glass and glazing.

F. Coordinate installation of frames with installation of hardware specified in Section 08710 and other related Sections.

G. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

3.3 ADJUST AND CLEAN

A. Adjust work under provisions of Section Division 1.

B. Adjust door for smooth and balanced door movement.

C. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

D. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.

E. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

SECTION 08 21 12

WOOD DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Specification Sections, apply to this section.

1.2 SECTION INCLUDES

A. Flush wood doors; fire rated and non-rated.

1.3 RELATED SECTIONS

A. Section 08 11 12 - Standard Steel Frames: Steel door frames.

B. Section 08 71 00 - Door Hardware.

C. Section 08 80 0 - Glazing.

D. Section 09 90 00 - Painting.

1.4 REFERENCES

A. ANSI A135.4 - Basic Hardboard.

B. ANSI/HPMA HP - Hardwood and Decorative Plywood.

C. ASTM E152 - Methods of Fire Tests of Door Assemblies.

D. ASTM E413 - Classification for Determination of Sound Transmission Class.

E. AWI - Quality Standards of the Architectural Woodwork Institute.

F. NFPA 80 - Fire Doors and Windows.

G. NFPA 252 - Standard Method of Fire Tests for Door Assemblies.

H. UL 10B - Fire Tests of Door Assemblies.

I. Warnock-Hersey - Certification Listings for fire doors.

1.5 SUBMITTALS

A. Submit under provisions of Division 1.

B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required special beveling, special blocking for hardware, identify cutouts for glazing and louvers.

C. Product Data: Indicate door core materials and construction; veneer species, type and characteristics; factory machining criteria.

D. Samples: Submit two samples of door construction, 6 x 6 inch in size cut from top or bottom corner of door.

E. Samples: Submit two samples of door veneer, 3 x 3 inch in size illustrating species and wood grain.

F. Manufacturer's Installation Instructions: Indicate special installation instructions.

G. This specification may indicate an approved equal to an item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the

submitting company's negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder's attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with AWI Quality Standard.

1.7 QUALIFICATIONS

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

1.8 REGULATORY REQUIREMENTS

A. Fire Door Construction: Conform to ASTM E152, NFPA 252, or UL 10B as required by Rhode Island State Building Code.

B. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as scheduled or indicated.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Division 1.

B. Package, deliver and store doors in accordance with AWI and Division 1.

C. Accept doors on site in manufacturer's packaging. Inspect for damage.

D. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week. Break seal on-site to permit ventilation.

1.10 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.11 COORDINATION

A. Coordinate work under provisions of Division 1.

B. Coordinate the work with door opening construction, door frame and door hardware installation.

1.12 WARRANTY

A. Provide warranty under provisions of Division 1 to the following term:

1. Interior doors: Life of Installation.

B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Forte-Harring.

B. Vt-Eggers Industries.

C. Substitutions: Under provisions of Division 1.

2.2 DOOR TYPES

A. Flush Interior Doors: 1 3/4 inches thick; solid core construction, fire rated and non-rated as indicated.

2.3 FRAME CONSTRUCTION

A. Core (Solid, Non-Rated): AWI Section 1300, Type SLC-Glued Block or PC Particleboard.

B. Core (Solid, Fire Rated): AWI Section 1300, Type FD-1-1/2 or as scheduled or indicated on Drawings.

2.4 FLUSH DOOR FACING

A. Veneer facing (Flush Interior Doors): AWI grade 1, Premium Red Oak rotary Cut, for stain finish.

2.5 ADHESIVE

A. Facing Adhesive: Type I - Waterproof, Type II core assembly.

2.6 ACCESSORIES

A. Glass stops at non-rated doors shall be wood type, W3 shape.

B. Glass stops at “B” and “C” label doors shall be rolled metal type designed to conform to UL requirements.

C. Glass stops at 20 minute doors shall be wood type W3/20 shape.

2.7 FABRICATION

A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.

B. Fabricate fire rated doors in accordance with AWI Quality Standards and to UL requirements. Attach fire rating label to door.

C. Provide lock blocks at lock edge and top of door for closer hardware reinforcement.

D. Vertical Exposed Edge of Stiles: Hardwood for paint finish.

E. Fit door edge trim to edge of stiles after applying veneer facing.

F. Bond edge banding to cores.

G. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.

H. Factory pre-fit doors for frame opening dimensions identified on shop drawings.

2.8 FINISH

A. All door shall be factory finished

B. Doors to be factory finished with stain as selected by the architect from all available colors choices, with an attempt to match the existing door finish.

1. Factory finishing system shall conform to AWI Quality Standard Section 01300, System Number 5 - transparent, catalyzed polyurethane, premium quality, stain.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify frame opening conditions under provisions of Division 1.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerances for size or alignment.

3.2 INSTALLATION

A. Install fire rated and non-rated doors in accordance with AWI Quality Standards, NFPA 80 and to Warnock Hersey requirements.

B. Trim non-rated door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to a maximum of 2/3 inch. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

D. Pilot drill screw and bolt holes. Use threaded through bolts for half surface hinges.

E. Machine cut for hardware. Core for handsets and cylinders.

F. Coordinate installation of doors with installation of frames specified in Section 08 11 12 and hardware specified in Section 08 71 00.

G. Coordinate installation of glass and glazing.

H. Install door louvers plumb and level.

3.3 INSTALLATION TOLERANCES

A. Conform to AWI requirements for fit and clearance tolerances.

B. Conform to AWI Section 01300 requirements for maximum diagonal distortion.

C. Maximum Diagonal Distortion (WARP): 1/8 inch measured with straight edge or taunt string, corner to corner, over an imaginary 36 x 84 inch surface area.

D. Maximum Vertical Distortion (bow): 1/8 inch measured with straight edge or taught string, top to bottom, over an imaginary 36 84 inch surface area.

E. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taught string, edge to edge, over an imaginary 36 x 84 inch surface area.

3.4 ADJUSTING

A. Adjust work under provisions of Division 1.

B. Adjust door for smooth and balanced door movement.

END OF SECTION

SECTION 08 41 13

ALUMINUM STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum doors, frames, and glazed lights.

B. Glass.

C. Anchors, brackets, and attachments.

D. Door hardware.

E. Perimeter sealant.

1.2 PRODUCTS INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

A. Section 08 71 00 - Door Hardware: Door hardware items other than specified in this Section.

1.3 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications.

B. Section 06 00 01 - Carpentry Work: Wood Blocking.

C. Section 08 71 00 - Door Hardware.

D. Section 07 90 00 - Joint Sealers: Perimeter sealant and backup materials.

E. Section 08 80 00 - Glazing.

1.4 REFERENCES

A. ANSI/ASTM A36 - Structural Steel.

B. ANSI/ASTM A386 - Zinc Coating (Hot Dip) on Assembled Steel Products.

C. ANSI/ASTM A446 - Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality.

D. ANSI/ASTM B221 - Aluminum Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

E. ANSI/ASTM E283 - Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors.

F. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

G. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

H. FS TT-P-641 - Primer Coating; Zinc Dust-Zinc Oxide (for Galvanized Surfaces).

I. FS TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.

1.5 PERFORMANCE

A. System to provide for expansion and contracting within system components caused by a cycling temperature range of 170 F degrees without causing detrimental effects to system or components.

B. Design and size members to withstand dead loads and live loads caused by pressure and suction of wind as calculated in accordance with RI State Building code and as measured in accordance with ANSI/ASTM E330.

C. Limit mullion deflection to 1/175 or flexure limit of glass with full recovery of glazing materials, whichever is less.

D. Limit air infiltration through assembly to 0.06 cu. ft/min/sq ft of assembly surface areas, measured at a reference differential static air pressure across assembly of 1.56 psi as measured in accordance with ANSI/ASTM E283.

E. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1

B. Include elevations and sections; system and component dimensions; components within assembly; framed opening requirements and tolerances; anchorage and fasteners; glass and infills; door hardware requirements; and affected related work.

C. Submit manufacturer's installation instructions under provisions of Division 1.

D. Submit samples under provisions of Division 1.

E. Submit two samples illustrating prefinished aluminum surface and specified glass.

F. Submit test reports from AAMA accredited laboratory certifying performance requirements.

G. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1 Product Substitution.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle system components under provisions of Division 1.

B. Provide wrapping or strippable coating to protect prefinished aluminum surfaces.

1.8 WARRANTY

A. Provide one year manufacturer’s warranty under provisions of Division 1.

B. Warranty: Cover complete system for failure to meet specified requirements.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Oldcastle Building Envelope: FG-2000 (interior only)

B. Substitutions: Under provisions of Division 1.

2.2 MATERIALS

A. Extruded Aluminum: ANSI/ASTM B221; 6063 T52 alloy and temper.

B. Sheet Aluminum: ASTM B209.

C. Sheet Steel: ANSI/ASTM A446; galvanized in accordance with (G90) 1.25 oz/sq ft.

D. Steel Sections: ANSI/ASTM A36; shapes to suit mullion sections.

E. Touch-Up Primer for Galvanized Surfaces: FS TR-P-641.

F. Fasteners: Stainless steel or aluminum.

2.3 FABRICATED COMPONENTS

A. Frames: 1 3/4" x 4-1/2" inch profile; 0.188 inch wall thickness; flush glazing stops.

B. Doors: 1 3/4 inches thick, 3-1/2 inch wide top rail, 4-1/4 inch wide vertical stiles, 8-1/2 inch bottom rail 9 inch wide cross rail; 0.188 inch wall thickness; square snap-in glazing stops.

C. Reinforced Mullion: Extruded aluminum cladding with internal reinforcement of steel shaped structural section.

2.4 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: As specified in Section 08 80 00.

B. Glass in Interior Lights: Clear, 1/4 inch thick, and 3/8" thick single pane; Tempered Safety Glass.

C. Glass in Interior Doors: Clear, 1/4 inch thick, single pane, Tempered Safety Glass.

2.5 HARDWARE

A. Pull: PH-10 finish same as door.

B. Hinges shall be Roton #780-112HD.

C. Closer: LCN 2010 Series, concealed overhead closer.

D. Cylinder Lock: Specified in Section 08 71 00.

E. All door lock/cylinders shall be key with this package and coordinated with the Owner's key system as defined in Section 08 71 00. Key systems shall be integral and matching.

2.6 FABRICATION

A. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.

B. Rigidly fit and secure joints and corners with screw and spline. Make joints and connections flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchorage items.

D. Arrange fasteners, attachments, and jointing to ensure concealment from view.

E. Prepare components with internal reinforcement for door hardware.

2.7 FINISHES

A. Exterior and Interior Extruded Aluminum Framing: Color Anodized Class I; AA-M12-C22-A42; AAMA 605.2 color Clear Aluminum or as selected by Architect.

B. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A386 to 2.0 oz/sq ft.

C. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify wall openings and adjoining air and vapor seal materials are read to receive work of this Section.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install doors, frames, glazing and hardware in accordance with manufacturer's instructions.

B. Use anchorage devices to securely attach frame assembly to structure, use all solid block or angle as required.

C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

D. Coordinate attachment and seal of air and vapor barrier materials. Install flashings.

E. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install hardware using templates provided. Refer to Section 08 71 00 for installation requirements.

G. Install glass in accordance with Section 08 80 00, using exterior dry method of glazing.

H. Install interior perimeter sealant, backing materials, and installation requirements in accordance with Manufacturer’s recommended practices.

3.3 TOLERANCES

A. Variation from Plane: 0.03 inches per foot maximum or 0.25 inches per 30 feet, whichever is less.

B. Misalignment of Two Adjoining Members Abutting in Plane: 0.015 inches.

3.4 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section shall provide for new door hardware. All hardware to be provided shall meet or exceed the requirements as set forth by the Americans with Disabilities Act and all ANSI standards.

C. This Section shall provide for new as well as the replacing of all existing door hardware. All hardware to be provided shall meet or exceed the requirements as set forth by the Americans with Disabilities Act and all ANSI standards.

D. This section will require that all new hardware provided under this section be keyed to provide a Master, a SubMaster and Individual control of the door hardware. It shall also be compatible with the entire existing library building lock set system. Key system shall be coordinated between the owner and the door hardware supplier.

E. Where existing hardware is to be reused, this contractor shall provide all the necessary labor to remove the associated hardware and reinstall the existing hardware to the new door leaf or frame. This shall include the labor to bore, mortise, screw or reinstall and any other necessary means to adapt or install the new product to an existing item.

F. This Section includes the following:

1. Hinges.
2. Locksets.
3. Closers.
4. Cylinder lock.
5. Door trim units.
6. Protection plates.
7. Panic hardware.
8. Any and all other required hardware necessary to complete the package, or as required for code compliance, or system design and the design intent as shown on the construction drawings.
9. Review plans and specifications provide any additional material not specified to allow door unit to function properly and provide the necessary weather or smoke seal ensuring building and energy codes are met.
10. Research all existing door conditions for compliance with the specified door hardware, provide all new templates as may be required.
11. The hardware supplier to research the complete compatibility of the system under this section to be completely compatible with the entire library system lock set presently in use.

1.3 PRODUCTS FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish templates to Section 08 11 12 and 08 21 10 for door and frame preparation.

1.4 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry

B. Section 08 41 00 - Aluminum Storefronts

C. Section 08 11 12 - Standard Steel Doors and Frames.

D. Section 08 21 10 - Flush Wood Doors.

E. Section 09 29 00 - Gypsum Board Systems

1.5 REFERENCES

A. ANSI A117.1 - Specifications for making buildings and facilities accessible to and usable by physically handicapped people.

B. ANSI/NFPA 80 - Fire Doors and Windows.

C. AWI - Architectural Woodwork Institute.

D. BHMA - Builders' Hardware Manufacturers Association.

E. DHI - Door and Hardware Institute.

F. NAAM - National Association of Architectural Metal Manufacturers.

G. FPA 101 - Life Safety Code.

H. SDI - Steel Door Institute.

I. ADA - Americans with Disabilities Act.

1.6 SUBMITTALS

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

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Final hardware schedule coordinated with new and existing doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into “hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

a. Type, style, function, size, and finish of each hardware item.

b. Name and manufacturer of each item.

c. Fastenings and other pertinent information.

d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.

e. Explanation of all abbreviations, symbols, and codes contained in schedule.

f. Mounting locations and heights for each type of hardware.

g. Door and frame sizes and materials.

h. Keying information.

i. Provide certificate under Division 1 that fire rated hardware meets or exceeds specified requirements.

2. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.

3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owners final instructions on keying of locks has been fulfilled.

D. Samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.

E. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

F. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non-conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division1, Product Substitution.

1.7 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Require supplier to meet with Owner and their representatives to finalize keying requirements and to obtain final instructions in writing.

C. Manufacturers: Companies specializing in supplying commercial institutional door hardware with five years documented experience.

D. Hardware Supplier: Company specializing in supplying commercial institutional door hardware with five years documented experience, and approved by the Architect.

E. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist the Architect and Owner for hardware and work in this Section.

1.8 CERTIFICATIONS

A. Architectural Hardware Consultant shall inspect complete installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified herein.

B. Provide two copies of certifications to Architect.

1.9 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

F. Deliver keys to owner by security shipment direct from hardware supplier. Keys are not to be released without the authorization of the Owner's project representative Clerk of the Works, and/or the Architect.

G. Protect hardware from theft by cataloging and storing in secure area. Lost or stolen hardware will not be the responsibility of the owner. The general contractor will be responsible for all hardware items.

1.10 REGULATORY REQUIREMENTS

A. Conform to applicable code for requirements applicable to fire rated doors and frames.

B. Conform to the applicable sections of Chapter 5 of NFPA 101.

1.11 MAINTENANCE AND OPERATION DATA

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owners continued adjustment, maintenance, and removal and replacement of door hardware.

B. Submit and maintenance data under provisions of Division 1.

C. Include data on operation hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.12 WARRANTY

A. Provide five-year warranty under provisions of Division 1.

1.13 COORDINATION

A. Coordinate under provisions of Division 1.

B. Coordinate work of this section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

PART 2 – PRODUCTS

2.1 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section.

B. Provide hardware for any and all doors as shown on plans. All doors must receive hardware to provide for a complete hardware package, which satisfied all applicable codes. Failure of the hardware supplier to provide hardware for any door unit that is shown in plan or elevation will not relieve them of their responsibility to provide any/all hardware necessary, at no additional charge to the Owner.

2.2 ACCEPTABLE MANUFACTURERS

A.	Hinges:	Stanley	Hager	McKinney
B.	Lock Sets:	Sargent	Schlage	
C.	Closers:	LCN		
D.	Gasketing:	Pemko	Reese	Nat. Guard
E.	Panic Device:	Sargent	Precision	VonDuprin
F.	Cylinder			
G.	Locks:	Sargent	Schlage	Russwin
H.	Protection Plates:	Sargent	Russwin	Rockwood
I.	Wall Bumpers:	H.B. Ives	Baldwin	Russwin
J.	Push/Pulls:	H.B. Ives		
K.	Thresholds:	Pemko	Reese	Nat. Guard
L.	Coordinators:	H.B. Ives	Russwin	Corbin
M.	Exit Devices:	Sargent		
N.	Sweeps:	Pemko		

O. Substitution under provision of Division 11.

2.3 MATERIALS AND FABRICATION

A. Manufacturers Name Plate: Do not use manufacturers' products that have manufacturers name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.

1. Manufacturers identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturers standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including 'prepared for paint" surfaces to receive painted finish.

2.4 HINGES, BUTTS, AND PIVOTS

A. Templates: Provide only template-produced units.

B. Screws: Provide Phillips flat-head screws complying with the following requirements:

1. For metal doors and frames install machine screws into dolled and tapped holes.

2. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Out-Swing Exterior Doors: Non removable pins.

2. Interior Doors: Non swing pins.

3. Tips: Flat button and matching plug, finished to match leaves.

D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.

E. Provide special hinges for offsets, and doors requiring a greater than 90 degree door swing.

2.5 LOCK CYLINDERS AND KEYING

A. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), either new or integrated with Owner's existing system.

B. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

C. Comply with Owners instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.

1. Permanently inscribe each key with number of lock that identifies cylinder manufacturers key symbol, and notation, "DO NOT DUPLICATE."

D. Key Material: Provide keys of nickel silver only.

E. Key Quantity: Furnish 3 change keys for each lock, 5 master keys for each master system, and 5 grandmaster keys for each grandmaster system.

1. Furnish one extra blank for each lock.

2. Deliver keys to Owner.

2.6 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturers standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.

1. Provide flat lip strikes for locks with 3-piece, antifriction latchbolts as recommended by manufacturer.

2. Provide roller type strikes where recommended by manufacturer of -the latch and lock units.

B. Lock Throw: Provide 5/8-inch minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

1. Provide 1/2-inch minimum throw of latch for other bored and preassembled types of locks and 3/4-inch minimum throw of latch for mortise locks. Provide 1-inch minimum throw for all dead bolts.

C. Rabbeted Doors: Where rabbeted door stiles are indicated, provide special rabbeted front on lock and latch units and bolts.

2.7 DOOR TRIM UNITS

A. Fasteners: Provide manufacturers standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.

B. Fabricate edge trim of stainless steel to fit door thickness in standard lengths or to match height of protection plates.

C. Fabricate protection plates not more than 2 inches less than door width on hinge side and not more than 1/2 inch less than door width on pull side by height indicated.

1. Metal Plates: Stainless steel, 0.050 inch (U.S. 18 gage).

2.8 WEATHERSTRIPPING AND SEALS

A. Provide smoke seals at existing stairwell all fire rated partitions doors, or fire separation doors to comply with all applicable codes.

2.9 HARDWARE FINISHES

A. Match items to the manufacturers standard color and texture finish for the latch and lock sets.

B. Provide finishes that match those established by BHMA or, if none established, match the Architect's sample.

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturers standards, but in no case less than specified by referenced standards for the applicable units of hardware.

D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

E. All final hardware finishes shall be selected by the Architect.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.

1. Install hardware in accordance with manufacturer's instructions and requirements of SDI, ANSI/NFPA 80, BHMA, DHI, NAMM and AWI.
2. Use the templates provided by hardware item manufacturer.
3. Conform to ADA and ANSI A117.1 for positioning requirements for the handicapped.
4. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
5. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

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

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers."

F. Weatherstripping and Seals: Comply with manufacturer’s instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Instruct Owners personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

3.3 HARDWARE SCHEDULE

A. General: Provide hardware for each and all doors to comply with requirements of Section “Door Hardware", hardware set numbers shall indicate in door schedule the following schedule of hardware sets. Supplier shall review existing building conditions and make all hardware conform to match all existing condition. A detail schedule shall be submitted.

1 1/2 PR HINGES

1 - EXIT DEVICE

1 - CYLINDER / LOCK AND LATCH SETS

1 - STRIKE

2 - KICK PLATES

1 - THRESHOLD

1 ea. - PUSH/PULL

1 - STOPS

1 - DOOR BOTTOM

1 - CLOSER

3.4 INTERIOR PASSAGE DOORS

1.5 PAIR HINGES	FBB179 4.5 X 4.5 26D
1 LOCKSET	LS 2 X LEVER DESIGN X 26D
1 CLOSER	4111N X ALUM
1 STOP	WALL OR FLOOR AS REQUIRED
3 SILENCERS	20RM

3.5 INTERIOR CLASSROOM DOORS

1.5 PAIR HINGES	FBB179 4.5 X 4.5 26D
1 LOCKSET	LS 1 X LEVER DESIGN X 26D
1 CLOSER	4111N X ALUM
1 STOP	WALL OR FLOOR AS REQUIRED
3 SILENCERS	20RM

3.6 INTERIOR OFFICE DOORS

1.5 PAIR HINGES	FBB179 4.5 X 4.5 26D
1 LOCKSET	LS 4 X LEVER DESIGN X 26D

1 STOP	WALL OR FLOOR AS REQUIRED
3 SILENCERS	20RM

3.7 INTERIOR STORAGE ROOM DOORS

1.5 PAIR HINGES	FBB179 4.5 X 4.5 26D
1 LOCKSET	LS 5 X LEVER DESIGN X ABBR. O/S LEVER
1 CLOSER	4111N X ALUM
1 STOP	WALL OR FLOOR AS REQUIRED
3 SILENCERS	20RM

3.8 INTERIOR TOILET ROOM DOORS (SINGLE USER)

1.5 PAIR HINGES	FBB179 4.5 X 4.5 26D
1 LOCKSET	LS 3 X LEVER DESIGN X ABBR. O/S LEVER
1 CLOSER	4111N X ALUM
1 KICKPLATE	8" X 2" LESS THAN THE DOOR WIDTH
1 STOP	WALL OR FLOOR AS REQUIRED
3 SILENCERS	20RM

3.9 GENERAL HARDWARE INFORMATION

FURNISH DOOR CLOSURES FOR ALL FIRE RATED OPENINGS.

LCN 4011N (PULL SIDE MOUNT)

LCN 4111N (PUSH SIDE MOUNT)

LCN 4040SE SENTRONIC

MOUNT DOOR CLOSERS ON SIDE WITH LEAST AMOUNT OF PUBLIC VIEW.

MASTER ALL NEW AND EXISTING (LEVER ONLY) LOCKSETS AND CYLINDERS AS DIRECTED BY THE OWNER AND ARCHITECT.

MAGNETIC HOLD OPENERS SHALL BE PROVIDED AT ALL INTERIM EGRESS DOORS

H: HINGE - FBB 179, FBB 191, 4.5 x 4.5 x FINISH

R - ROTON #780-112HD

ED: EXIT DEVICE - 12-8613 ETL OR 12-8713 ETL x FINISH(26D) 12-8813 ETL x FINISH(26D)

C: CYLINDER - AS REQUIRED "PRIMUS" LEVEL TWO OR MATCH LOCK SET SYSTEM OR AS REQUIRED BY THE OWNER FOR A STANDARD MASTER KEY SYSTEM

CL: CLOSER - 4111N X ALUM

KP: KICK PLATE - 8" X 2" (SS) LESS THAN THE WIDTH OF THE DOOR

PUSH PLATE 8200 PULL 8305 USE 8302 ROUND PULL HANDEL

S: STOPS - WALL OR FLOOR AS REQUIRED

SCI: SILENCERS - 20 RM - 3 PER DOOR LEAF

TH: THRESHOLD - 171 A X 1/2" HANDICAP HEIGHT

DOOR BOTTOMS - $^{X}2$: SURFACE MOUNTED UNIT BY PEMKO #4301

SW: SWEEP - #S-88 & #4131 (CNBC)

FB: FLUSH BOLT "IVES" #458 (2 PER LEAF)

PP: DOOR PULL & DOOR PLATE- #107 X 70C & 70C

LS: LOCK SET SCHLEDGE

LS 1 - D70PD X LEVER DESIGN X FINISH - ALL CLASSROOMS

LS 2 - D10S X LEVER DESIGN X FINISH - PASSAGE

LS 3 - D40S X LEVER DESIGN X FINISH - SINGLE USER TOILET ROOM

LS 4 - D53PD X LEVER DESIGN X FINISH - OFFICE

LS 5 - D80PD X LEVER DESIGN X FINISH - CLOSET

LS 5T - D80PD X LEVER DESIGN X FINISH X ABBR O/S LEVER -STORAGE OR HAZARD AREAS

HARDWARE SCHEDULE				
Door #	Room #	Location	Lock Set	Remarks
101		Existing Stair Tower		Relocate and reuse door, frame, and hardware.
102	207	Toilet	LS-3	
103	208	Corridor	LS-4	
104	211	Janitor	LS-5	
105	206	Toilet	LS-3	
106	202	Copy Storage	LS-4	
107	204	Office	LS-4	
108	203	Office	LS-4	
109	201	Computer	Cylinder	Primus, coordinate with aluminum storefront system. Roton Hinge.
110	201	Computer	Cylinder	Primus, coordinate with aluminum storefront system. Roton Hinge.
111	210	Classroom	Cylinder	Primus, coordinate with aluminum storefront system. Roton Hinge.
112	210	Classroom	Cylinder	Primus, coordinate with aluminum storefront system. Roton Hinge.

END OF SECTION

SECTION 08 80 00

GLAZING

PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Interior door entrances and other doors, transoms, and sidelights.

2. Hollow metal frames and interior sidelights.

1.3 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealers: Sealant and back-up materials.

B. Section 08 11 12 - Standard Steel Doors and Frames.

C. Section 08 41 00 - Aluminum Entrances & Store Fronts

1.4 REFERENCES

A. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

B. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing used in buildings.

C. ASTM C1036 - Flat Glass.

D. ASTM C1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and UnCoated Glass.

E. ASTM E546 - Test Method for Frost Point of Sealed Insulating Glass Units.

F. ASTM E576 - Test Method for Dew/Frost Point of Sealed Insulating Glass Units in Vertical Position.

G. ASTM E773 - Test Method for Seal Durability of Sealed Insulating Glass Units.

H. ASTM E774 - Sealed Insulating Glass Units.

I. FGMA - Glazing Manual.

J. FGMA - Sealant Manual.

K. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, Solvent release type.

L. FS TT-S-00227 - Sealing Compound, Rubber Base, Two Component.

M. FS TT-S-00230 - Sealing Compound, Synthetic-Rubber Base, Single Component, Chemically Curing.

N. FS TT-S-01543 - Sealing Compound, Silicone Rubber Base.

O. FS TT-G-410 - Glazing Compound, Sash (Metal) for Back Bedding and Face Glazing (Not for Channel or Stop Glazing).

P. SIGMA - Sealed Insulated Glass Manufacturers Association.

1.5 DEFINITIONS

A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

1.6 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

B. Glass Design: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:

1. Minimum glass thickness, nominally, of lites in exterior walls is 6.0 mm (0.23 inch).

C. Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.7 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each glass product and glazing material indicated.

C. Samples for verification purposes of 12-inch-square samples of each type of glass indicated except for clear monolithic glass products.

D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

1. Separate certifications are not required for glazing materials beading manufacturers permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

E. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturers interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

F. Product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.

G. Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

H. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non-conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission.

The bidder's attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.8 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. FGMA Publications: "FGMA Glazing Manual."

B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category 11 materials.

1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

D. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:

1. Heat-treated glass of each (ASTM C 1048) condition indicated.

E. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Deliver, store and protect products to site under provisions of Division

1.10 PREINSTALLATION CONFERENCE

A. Convene one week prior to commencing work of this Section, Under provisions of Division 1.

1.11 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes

1.12 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds

1.13 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on Drawings or as instructed by the manufacturer

1.14 COORDINATION

A. Coordinate Work under provisions of Division 1.

B. Coordinate the Work with glazing frames wall openings and adjacent work.

1.15 WARRANTY

A. Provide ten-year manufacturer's warranty under provisions of Division 1.

B. Warranty: Include coverage of sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 - PRODUCTS

2.1 ACCEPTABLE GLASS MANUFACTURERS

A. PPG Industries, Inc.

B. Substitutions: Under provisions of Division 1.

2.2 PRIMARY FLOAT GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class as indicated below, and Quality q3 (glazing select).

1. Class 1 (clear) unless otherwise indicated.

B. Tempered Safety Glass: ASRM C1048, kind FT; fully tempered; Condition A uncoated; Type1 transparent flat, Class 1 Clear, or as selected by the Architect. 1/4 inch thick minimum; Quality Q3 glazing select; conforming to ANSI 297.1.

2.3 HEAT-TREATED FLOAT GLASS PRODUCTS, GENERAL

A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

2.4 HEAT-TREATED FLOAT GLASS

A. Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.

1. Kind FT (fully tempered) where indicated.

2.5 ACCEPTABLE GLAZING COMPOUND MANUFACTURERS

A. Pecora.

B. Dow Corning.

C. Tremco.

D. Substitutions: Under provisions of Division1.

2.6 ACCEPTABLE GLAZING ACCESSORIES MANUFACTURERS

A. Woodmont Products, Inc.

B. Tremco.

C. PTI.

D. Substitutions: Under provisions of Division 1.

2.7 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.

B. Elastomeric Glazing Sealant Standard: Provide manufacturers standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements indicated on each Elastomeric Glazing Sealant Product Data Sheet at the end of this Section, including those referencing ASTM classifications for Type, Grade, Class and Uses.

1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Glazing Sealant Product Data Sheet, provide products, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, nonstaining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:

1. AAMA 804.I.

B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (sidewalking).

2.10 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.

2. Presence and functioning of weep system.

3. Minimum required face or edge clearances.

4. Effective sealing between joints of glass-framing members.

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

3.2 PREPARATION

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

3.3 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation as follows:

1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturers label.

2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:

1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

1. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each lite is installed.

3.5 SEALANT GLAZING (WET)

A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.6 PROTECTION AND CLEANING

A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

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

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt. scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes. accidents and vandalism, during construction period.

E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

SECTION 09 20 00

GYPSUM BOARD SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Stud wall framing and metal channel ceiling framing.

B. Acoustic insulation.

C. Gypsum board attached to framing and furring members.

D. Cement board attached to framing and furring members.

E. Taped and sanded joint treatment for gypsum board.

F. Joint treatment and finish system for cement board.

G. Repair to all existing wall surface as a result of removal of any equipment, existing damage, or damage by construction.

1.3 RELATED SECTIONS

A. Section 06 10 00 - Carpentry Work: Wood blocking and framing.

B. Section 07 21 16 - Batt and Blanket Insulation.

C. Section 08 11 12 - Standard Steel Frames.

D. Section 08 41 00 – Aluminum Storefront

E. Section 09 90 00 - Painting.

1.4 REFERENCES

A. ANSI/ASTM C36 - Gypsum Wallboard.

B. ANSI/ASTM C79 - Gypsum Sheathing Board.

C. ANSI/ASTM C442 - Gypsum Backing Board.

D. ANSI/ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.

E. ANSI/ASTM C630 - Water Resistant Gypsum Backing Board.

F. ANSI/ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.

G. ANSI/ASTM C646 - Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gage Steel Studs.

H. ANSI/ASTM C754 - Installation of Framing members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.

I. ANSI/ASTM E90 - Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.

J. ANSI/ASTM E119 - Fire Tests of Building Construction and Materials.

K. ASTM C665 - Mineral Fiber Blanket Thermal Insulation for light Frame Construction and Manufactured Housing.

L. GA-201 - Gypsum Board for Walls and Ceilings.

M. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

1.5 SYSTEM DESCRIPTION

A. Acoustic Attenuation for Identified Interior Partitions: STC in accordance with ANSI/ASTM E90 as indicated on Drawings.

1.6 QUALITY ASSURANCE

A. Applicator: Company specializing in gypsum board systems work with 5 years documented experience and approved by the Architect.

B. Single-Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assemblies.

1. Fire Rated Partitions: Listed assembly by UL as indicated on Drawings.

2. Fire Rated Ceiling: Listed assembly by UL as indicated on Drawings.

3. Fire Rated Structural Beam and Column Framing: Listed assembly by UL as indicated on Drawings.

1.8 SUBMITTALS

A. Submit under provisions of Division 1.

B. Shop Drawings: Indicate special details associated with fireproofing, acoustic seals, and fire ratings.

C. Product Data: Indicate metal framing, gypsum board, cement board, joint tape, and edge trim.

D. Submit manufacturer's installation instructions.

E. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

C. Handle gypsum boards to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads and trim.

1.10 PRE-INSTALLATION CONFERENCE

A. Convene a preinstallation conference a minimal of two weeks prior to commencing work of this Section and under provisions of Division 1. Architect to be present to review all conditions prior to any work under this section.

1.11 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.

B. Minimum Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg. F (4 deg. C). For adhesive attachment and finishing of gypsum board maintain not less than 50 deg F (10 deg C) for 48 hours prior to application and continuously thereafter until drying is complete.

C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER'S - GYPSUM BOARD SYSTEM

A. United States Gypsum Company.

B. Substitutions: Under provisions of Division 1.

2.2 GYPSUM BOARD MATERIALS

A. Standard Gypsum Board: ANSI/ASTM C36; 1/2 and 5/8 inch thick as indicated, maximum permissible length; ends square cut, tapered edged.

B. Fire Rated Gypsum Board: ANSI/ASTM C36; fire resistive and moisture resistant type, UL rated; 1/2 ,5/8, 3/4, inch thick as indicated, maximum permissible length; ends square cut, tapered edged.

C. Moisture Resistant Gypsum Board: ANSI/ASTM C630; 1/2 and 5/8 inch thick as indicated, maximum permissible length; ends square cut, tapered edges.

D. Gypsum Backing Board: ANSI/ASTM C442; standard and fire rated type; 1/2 and 5/8 inch thick as indicated; square edges, ends square cut, maximum permissible length.

E. Gypsum Sheathing Board: ANSI/ASTM C79; moisture resistant and fire resistant type, 1/2 and 5/8 inch thick as indicated, maximum permissible length, ends square cut, square edges; water repellent paper faces.

F. Exterior Gypsum Ceiling Board: Standard and fire rated type, 5/8 inch thick, maximum permissible length, ends square cut, tapered and beveled edges.

2.3 TRIM ACCESSORIES

A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:

1. Casingbead: Equal to USG No. 200A or No. 200B where clearance is limited.
2. Cornerbead: Equal to USG No. 103 or No. 101 where clearance is limited.
3. Control joint: Equal to USG No. 93.

2.4 EXPANSION ACCESSORIES

A. Install all expansion trims and joints in accordance with the tolerances recommended by the manufacturer. Pattern to be approved by the architect prior to installation.

B. Contractor to submit sketch showing locations of all expansion joint locations for review and approval by the architect prior to their installation.

2.5 GYPSUM BOARD JOINT TREATMENT MATERIALS

A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.

B. Joint Tape: Paper reinforcing tape, unless otherwise indicated.

1. Use pressure sensitive open-weave glass fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.

C. Setting-Type Joint Compounds: Factory-prepackaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

1. Where setting-type joint compounds are indicated for use as taping and topping compounds, use formulation for each which develops greatest bond strength and crack resistance and is compatible with other joint compounds applied over it.

D. Drying-Type Joint Compounds: Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.

1. Ready-Mix Formulation: Factory-premixed product.

2. All-purpose compound formulated for use as both taping and topping compound.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of the gypsum board.

B. Gypsum Board Screws: ASTM C 1002.

C. Acoustical Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.

B. Beginning of installation means acceptance of existing surfaces.

3.2 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL:

A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840.

B. Install sound attenuation blankets in all walls, prior to gypsum board unless readily installed after board has been installed.

C. Located exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.

D. Install wall/partition boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At stairwells and similar high walls, install board horizontally with end joints staggered over studs.

E. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

F. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

G. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.

H. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

I. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32 inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.

J. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.) except in chase walls which are properly braced internally.

1. Except where concealed application is required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and will be limited to less than 75 percent of full coverage.

K. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.

L. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing.

M. Use screws when fastening gypsum board to furring or framing material.

N. Double Layer Applications: Use gypsum backing board for first layer, placed parallel to framing or furring members. Use fire rated gypsum backing board for fire rated partitions. Place second layer perpendicular to first layer. Offset joints of second layer from joints of first layer.

O. Erect exterior gypsum soffit board perpendicular to supports, with staggered end joints over supports.

P. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum ceiling board with sealant.

Q. Place control joints consistent with lines of building spaces as indicated or as directed.

R. Place control joints in all area as required by Manufacturer and reviewed and approved by the Architect. Control joints must adhere to Manufacturer’s recommendation.

S. Place corner beads at external corners as indicated. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials as indicated.

3.3 INSTALLATION OF DRYWALL TRIM ACCESSORIES

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

B. Install corner beads at external corners.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed.

3.4 JOINT TREATMENT

A. Tape, fill and sand exposed joints, edges and corners to produce smooth surface ready to receive finishes.

B. Perform taping operation in accordance with manufacturer's instructions.

C. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

D. Taping, filling and sanding is not required at surfaces behind adhesive applied ceramic tile.

3.5 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

3.6 FINISHING OF DRYWALL

A. General: Apply joint treatment of gypsum board joints (both directions), flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.

B. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compounds.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Finish interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:

1. Embedding and First Coat: Job-mixed drying-type taping compound.
2. Fill (Second) Coat: Job-mixed drying-type topping compound.
3. Finish (Third) Coat: Job-mixed drying-type topping compound

3.7 PROTECTION

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

END OF SECTION

SECTION 09 30 13

CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. All work under this Section includes complete surface preparation for the installation of all flooring and wall materials as specified throughout this section. Preparation shall include any and all necessary surface preparation that will produce and end result of a monolithic, smooth and blemish free surface to the floor material being applied. All surfaces that are unacceptable shall be prepared to provide for this result at no additional cost. Installer will be responsible for the acceptance of all finish surfaces. If surface is unacceptable, the installer shall immediately notify the General Contractor for their immediate repair.

B. Work included: Provide ceramic tile as indicated on drawings as specified herein and as required for a complete and proper installation including but not necessarily limited to:

1. Ceramic Tile: Walls and floors glazed and unglazed.

2. Membranes under Ceramic Tile on Floors.

1.3 RELATED SECTIONS

A. Section 06 10 00 - Carpentry Work.

B. Section 09 29 00 - Gypsum Board System.

1.4 QUALITY ASSURANCE

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

B. Installer must have a minimum of five years documented experience, and approved by the architect.

C. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.5 SUBMITTALS

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

B. Product data for each type of product specified.

C. Shop drawings indicating tile patterns and locations and widths of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1. Locate precisely each joint and crack in tile substrates by measuring, record measurements on shop drawings, and coordinate them with tile joint locations, in consultation with Architect.

D. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type and composition of tile indicated. Include samples of grout and accessories involving color selection.

E. This specification may indicate an approved equal to an item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company's negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder's attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.6 REFERENCES

A. ANSI/A118.4 - Latex - Portland Cement Mortar.

B. ANSI/A811.6 - Ceramic Tile Grout.

C. ANSI/A136.1 - Organic adhesives for installation of ceramic tile.

D. Tile Council of America - handbook for ceramic tile installation.

E. American Society for Testing and Material.

1.7 DELIVERY, STORAGE AND HANDLING

A. It will be the contractor's responsibility to store packaged material in original container with seals unbroken and label intact until time of use. Comply with requirements of ANSI A 137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.8 JOB CONDITIONS

A. Maintain environmental conditions during and after installation in accordance with reference standards and manufacturer's printed recommendations.

B. Maintain temperature of 50 degrees F minimum during tile work and for seven days after completion.

C. Vent temporary heaters to outside to avoid carbon dioxide damage to new tile work.

D. All floors shall be tested for moisture content using a calcium chloride moisture test and shall not exceed the limits of the product being installed.

E. All subfloor shall be rigid, smooth, flat and level, and free of dirt, grease, wax, paint, and old adhesive residue.

1.9 EXTRA STOCK

A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

B. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size.

C. All extra tile and material will become the property of the owner and neatly stored in a location as designated by the owner/architect.

1.10 PREINSTALLATION CONFERENCE

A. Conduct conference at Project Site to comply with requirements of Division 1 Section "Project Meeting". Architect to be present to review all conditions prior to any work under this section.

1.11 TILE COLOR SELECTION

A. Color selection from full range of tile available in the selected tile specification.

PART 2 - PRODUCT

2.1 ACCEPTABLE MANUFACTURER

A. Tile Manufacturer

1. DAL TILE
2. Substitution as per Division 1.

B. Dry-Set Mortars and Grouts

1. Bostik Construction Products Div.
2. H. B. Fuller
3. Laticrete International, Inc.
4. Mapei Corp.

C. Latex-Emulsion-Based Latex-Portland Cement Mortars

1. Bostik Construction Products Div.
2. H. B. Fuller
3. Laticrete International, Inc.
4. Mapei Corp.

2.2 PRODUCTS

A. GENERAL

1. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.

B. Provide all tile trims, pieces, corners, coves, setting materials, grout or any other material necessary to complete the intent of the job or as may be required to full fill the design intent shown on the documents.

2.3 ANSI STANDARD FOR TILE INSTALLATION MATERIALS

A. Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

1. Provide selections made by Architect from manufacturer's full range of standard colors, textures, and patterns for products of type indicated.
2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

2.4 FACTORY BLENDING

A. For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

2.5 TILE PRODUCTS

A. Shower Floor Tile: Dal Core Fundamentals “Advantage”

1. Composition: Ceramic
2. Nominal Facial Dimensions: 10 inches by 14 inches.
3. Nominal Thickness: 1/4 inch.
4. Face: Plain with cushion edges.
5. Color: To be determined.

B. Glazed Wall Tile: Dal Tile 4 x 12 color wheel selection Linear ceramic wall tile and all available accent tiles. Provide flat tile complying with the following requirements:

1. Nominal Facial Dimensions: 4 inches by 12 inches.
2. Nominal Thickness: 5/16 inch.
3. Face: Plain with cushion edge.
4. Bullnose trim at all end conditions.
5. Color: To be determined.

C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

1. Shapes: As follows, selected from manufacturer's standard shapes:
2. Base for Portland Cement Mortar Installations: Coved.
3. Wainscot Cap for Portland Cement Mortar Installations: Bullnose cap.
4. External Corners for Portland Cement Mortar Installations: Bullnose shape with a radius of at least 3/4 inches unless otherwise indicated.
5. Full integral cove base tile.
6. All integral trim corners, bullnose piece as required for a complete installation.

2.6 SETTING MATERIALS

A. Latex additive (water emulsion) described below, serving as replacement for part or all of gauging water, of type specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate mortar bed.

1. Latex Additive: Manufacturer's standard.

B. Dry-Set Portland Cement Mortar: ANSI A118.1.

1. Prepackaged dry mortar mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.

C. Latex additive (water emulsion) of type described below, serving as replacement for part or all of gauging water, combined at job site with prepackaged dry mortar mix supplied or specified by latex additive manufacturer.

1. Latex Type: Manufacturer's standard.

D. Organic Adhesive: ANSI A136.1, Type 1.

2.7 GROUTING MATERIALS

A. Latex-Portland Cement Grout: ANSI A118.6, color from full range of available grout colors and as selected by the Architect, composition as follows:

B. Prepackaged dry grout mix composed of portland cement, graded aggregate, and the following dry polymer additive in the form of a re-emulsifiable powder to which only water is added at job site.

1. Dry Polymer Additive: Ethylene vinyl acetate.

C. Latex additive (water emulsion) serving as a replacement for part or all of gauging water, added at job site with dry grout mixture, with type of latex and dry grout mix as follows:

1. Latex Type: Manufacturer's standard.

2.8 ELASTOMERIC SEALANTS

A. Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with requirements of Division 7 Section "Joint Sealers", including ASTM C 920 as referenced by Type, Grade, Class, and Uses.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

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

1. One-Part Mildew-Resistant Silicone Sealant:

a. "Dow Corning 786"; Dow Corning Corp.

b. "SCS 1702"; General Electric Co.

c. "863 #345 White", Pecora Corp.

d. "Rhodorsil 6B White", Rhone-Poulenc, Inc.

e. "Proglaze White"; Tremco Corp.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until satisfactory conditions are corrected.

B. Report all unacceptable surfaces to the architect and do not tile such surface until they meet proper industry standards as indicated by ANSI/A118.4.

C. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.

D. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

E. Do not commence installation until substrate is in conformance with TCA handbook recommendations.

F. Insure that all existing floor material has been removed, and existing surface is smooth and clean.

G. Beginning of installation means acceptance of existing surfaces and substrate.

3.2 PREPARATION

A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples. If not, factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.

B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.

C. Layout

1. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

2. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.

3. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.

a. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

4. Lay out tile wainscots to next full tile beyond dimensions indicated.

a. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealers".

5. Grout tile to comply with the requirements of the following installation standards:

a. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 FLOOR INSTALLATION METHODS

A. Ceramic Mosaic Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:

1. Portland Cement Mortar: ANSI A108.1

2. Bond Coat: Latex-portland cement mortar on cured bed, ANSI A108.5.

3. Bond Coat: Portland cement paste or dust coat on plastic bed or the following thin-set mortar on cured bed, ANSI A108.5, at Contractor's option:

a. Latex-portland cement mortar.

4. Grout: Latex-portland cement.

5. Organic Adhesive: ANSI A108.4

a. Concrete Subfloors, Interior: TCA F113-92 Lower Level.
F111-92 Upper Level.

b. Grout: Latex-portland cement.

3.5 WALL TILE INSTALLATION METHODS

A. Install types of tile designated for wall application to comply with requirements indicated below for setting-bed methods, TCA installation methods to related to subsurface wall conditions, and grout types:

1. Portland Cement Mortar: ANSI A108.1.
   a. Masonry or Concrete, Interior: TCA W211-92 (bonded).
   b. Grout: Latex-portland cement.
2. Organic Adhesive: ANSI A108.4.
3. Latex-Portland Cement Mortar: ANSI A108.5.

3.6 CLEANING AND PROTECTION

A. Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures that tile is without damage or deterioration at time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.7 SURFACE CONDITIONS

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

B. Report all unacceptable surfaces to the architect and do not tile such surface until they meet proper industry standards as indicated by ANSI/A118.4.

C. Prior to installing tile, remove dust, oil and other foreign substances from surfaces.

D. Where tile units will be thin set directly to plywood substrate, do not commence installation until substrate is in conformance with TCA handbook recommendation.

E. Verify that grounds, anchors, solid wood blocks, plugs, recess and similar items in or behind the tile have been installed before proceeding.

F. Insure that all existing floor material has been removed, and existing surface is smooth and clean.

G. Beginning of installation means acceptance of existing surfaces and substrate.

3.8 LAYOUT

A. Determine location of all accessories before starting tile work.

B. Lay out all tile work so as to minimize cuts less than one half tile in size.

C. Locate tile cuts in floor and walls so as to be least conspicuous.

D. Align all floor and wall joints to give straight uniform grout line, plumb and level.

E. Lay tile design as shown in drawings - Do not deviate from tile design and layout unless approved by the architect.

3.9 INSTALLATION

A. Comply with ANSI/A118.4 and the handbook of ceramic tile installations of the Tile Council of America accept as otherwise directed by the architect or specified herein.

B. Maintain minimum temperature limits and installation practices recommended by material manufacturers.

C. Lay tile in grid pattern unless otherwise indicated on drawings or as directed by the architect. Terminate tile neatly at obstructions, edges and corners without disruptions of patterns or joint or alignment. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruptions.

3.10 WORKMANSHIP

A. Supply first class workmanship in all tile work.

B. Use all product in strict accordance with recommendations and directions of manufacturer.

C. Proportion all mixes in accordance with latest ANSI standards specifications.

D. Smooth all exposed cut tile edges.

E. Be sure tile edges are clean before installing.

F. Fit tile carefully against trim and porcelain accessories, pipes, electrical boxes and other built in fixtures so that escutcheon plates and collars will completely overlap cut edges.

G. Be sure all tile work is free of grout film upon completion.

END OF SECTION

SECTION 09 51 10

SUSPENDED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Suspended metal and aluminum grid ceiling system.

B. Acoustical Panels.

C. Fire rated and non-fire rated assembly.

D. Perimeter trim.

1.3 RELATED SECTIONS

A. Section 09 29 00 - Gypsum Board Systems

B. Section 09 90 00 - Painting

C. Division 15 - Mechanical: Mechanical work.

D. Division 16 - Electrical: Electrical work and light fixtures.

1.4 REFERENCES

A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay in Panel Ceilings.

B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay in Panels.

C. UL - Underwriters Laboratories System Ratings.

1.5 SYSTEM DESCRIPTION

A. Conform to UL rating for Ceiling/floor and Ceiling/roof assembly(s) as indicated on Drawings.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of ceiling suspension system and ceiling tile with three years minimum documented experience.

B. Installer: Company with 3 years minimum documented experience, and approved by the Architect.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assembly and combustibility requirements for materials.

1.8 SUBMITTALS

A. Submit shop drawings and product data on metal grid system components, and acoustic units under provisions of Division 1.

B. Submit two samples, full size, illustrating material, edge design and finish of acoustic units.

C. Submit two samples each, 6 inches long, of suspension system main runner, cross runner, edge trim and hold down clips.

D. Submit color samples for color selection and approval.

E. Submit manufacturer's installation instructions under provisions of Division 1.

F. Coordination drawings for reflected ceiling plans drawn accurately to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules.
4. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinkler heads; and special moldings at walls, column penetrations and other junctures with adjoining construction.
    a. Scale: 1/8 inch = 1'- 0".

G. This specification may indicate an approved equal to an item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company's negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder's attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F, and humidity of 20 to 40 percent prior to, during and after installation.

1.10 SEQUENCING/SCHEDULING

A. Do not install acoustical ceilings until dust generating activities have terminated, and overhead work is completed, tested and approved.

B. Schedule installation of acoustic units after interior wet work is dry.

C. **DO NOT** install acoustical ceiling or enclose any ceiling area until all Architectural and Engineering inspections have been performed and approved to enclose by the architect.

D. Ceiling heights indicated on the plans at times may need to be adjusted for better project coordination. This contractor shall be required to work these modifications out at no additional cost to the owner or this project. Final ceiling height will need to be field verified due to the building conditions.

1.11 SEISMIC PERFORMANCE

A. Installation of suspended acoustical ceiling system and appurtenances shall meet the earthquake requirements of the Rhode Island State Building Code.

B. Seismic Hazard Exposure Group III.

C. Seismic Performance Category C.

1.12 EXTRA STOCK

A. Provide 1 extra carton each type acoustic panel to Owner under provisions of Division1.

1.13 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 ACCEPTABLE MANUFACTURERS - SUSPENSION SYSTEM

A. Armstrong.

B. USG.

C. Substitution under provisions of Section 01001.

2.2 SUSPENSION SYSTEM MATERIALS

A. Grid: ASTM C635 Prelude 8300 MX Series, intermediate duty, 24 x 24 and 24 x 48 inch grid systems, non-fire rated and fire rated as indicated on Drawings, exposed T; components die cut and interlocking complete with necessary supports and stiffeners..

B. Accessories: Stabilizer bars, clips, splices, and edge moldings and hold-down clips required for suspended grid system.

C. Grid Materials: Commercial quality cold rolled steel with galvanized coating and aluminum.

D. Grid Finish: Factory applied Ceiling Areas- White color on steel grid.

E. Grid Size: Standard Grid for proposed ceiling tile.

F. Support Channels and Hangers: Primed steel; size and type to suit application, to rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1/360, and equal to 5 times that imposed by ceiling construction as determined by testing per ASTM E488, conducted by a qualified independent testing laboratory.

G. Support Channels and Hangers: Provide type to suit application, to rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1/360, and equal to 5 times that imposed by ceiling construction as determined by testing per ASTM E488, conducted by a qualified independent testing laboratory. Follow all manufacturer written direction and requirements for this specified system.

H. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.

1. Gage: Provide wire sized so that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct-Hung) will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12-gage).

I. Hanger Rods: Mild steel, zinc coated, or protected with rust-inhibitive paint.

J. Flat Hangers: Mild steel, zinc coated, or protected with rust-inhibitive paint.

2.3 ACCEPTABLE MANUFACTURERS - ACOUSTIC UNITS

A. Armstrong.

B. USG

C. CertainTeed

D. Substitution as outline in Section 01 00 10.

2.4 ACOUSTIC UNIT MATERIALS

A. Acoustic Unit: Ceiling area 24 x 24 x 7/8 inch size, Class A, flame spread 25 U.L. label; non-combustible composition; USG Mars High-NRC #88135 non-sag lay in panel all areas unless otherwise noted.

2.5 ACCESSORIES

A. Gypsum Board: UL fire rated type 5/8 inch thick, ends and edges square, paper faced.

2.6 REQUIREMENT

A. Provide for a full fire rated ceiling system and assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that existing conditions are ready to receive work.

B. Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Verify that layout of hangers will not interfere with other work.

D. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install system in accordance with ASTM C636 and as supplemented in this Section.

B. Arrange acoustical units and orient directionally patterned units (if any) in manner shown by reflected ceiling plans.

1. Install tile with pattern running in one direction.

C. Install fire rated system in accordance with UL design number requirements indicated on Drawings.

D. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

E. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

F. Provide and install hangers and inserts as required to appropriate Sections.

G. Hang system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

H. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the distance.

I. Center system on room axis leaving equal border units according to the reflected ceiling plan.

J. Do not support components on main runners or cross runners if weights causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

K. Do not ecstatically load system, or produce rotation of runners.

L. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

M. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices that are secure and appropriate for structure to which hangers are attached as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

N. Space hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from end of each member.

O. Install edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.

1. Sealant Bed: Apply continuous ribbon of acoustical sealant, concealed on back of vertical leg before installing moldings. Additionally install a tight seal silicone bead to match grid from track edge to wall surface eliminating grid/wall irregularities.

2. Screw-attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely. Overlapped or square cut corners will not be accepted.

P. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge molding at junctions with other interruptions. **Field rabbet** tile edge. Where bullnose concrete corners occur, provide preformed closers to match edge molding.

Q. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.

R. Lay directional patterned units one way with pattern as approved by Architect. Fit border neatly against abutting surfaces.

S. Install acoustic units level, in uniform plane, and free from twist, warp and dents.

T. Lay acoustic insulation over ceiling where indicated on the Drawings.

U. Install hold-down clips to retain panels tight to grid system within 20 feet of an exterior door.

V. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with UL assembly requirements.

3.3 TOLERANCES

A. Variation from Flat and Level Surface: 1/8 inch in 10 Ft.

B. Variation from Plumb of Grid Members caused by Eccentric Loads: Two degrees maximum.

3.4 CLEANING

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING, SHEET VINYL, VINYL BASE, STAIR TREADS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the installation of flooring materials, or various styles and types.

B. All work under this Section includes complete surface preparation for the installation of all flooring materials as specified throughout this section. Preparation shall include any and all necessary surface preparation that will produce and end result of a monolithic, smooth and blemish free surface to the floor material being applied. All surfaces that are unacceptable shall be prepared to provide for this end result at no additional cost. Floor installer will be responsible for the acceptance of the floor finish surface. If floor surface is unacceptable, the installer shall immediately notify the General Contractor for their immediate repair.

C. All floor materials shall receive all sealers, wax or finishes applied under this section. Finish application shall be as specified by each floor manufacturer's recommendation. No floor surface shall be left unfinished.

D. This contractor shall be responsible for the removal or any adhesives, mortar, or other building materials found on the existing floor surface. The complete surface preparation shall be the floor installer's responsibility. This shall include any/all materials needed to comply with the floor manufacturer recommendation for installation of the floor materials herein specified

1.3 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. All necessary materials and items to complete the flooring installation and the design intent as shown on the construction documents.

1.4 RELATED SECTIONS

A. All Sections as required.

1.5 REFERENCES

A. ASTM E-84 - Surface Burning Characteristics of Building Materials.

B. FS L-F-1641 - Floor Covering, Translucent or Transparent Vinyl Surface, and Backing.

C. FS L-F-475 - Floor Covering, Vinyl Surface (Tile and Roll), with Backing.

D. FS RR-T-650 - Threads, Metallic and Non-Metallic, Non-skid.

E. FS SS-T-312 - Tile, Floor: Asphalt, Rubber, Vinyl, Vinyl Composition.

F. FS SS-W-40 - Wall Base: Rubber and Vinyl Plastic.

1.6 REGULATORY REQUIREMENTS

A. Conform to Rhode Island State Building Code for flame spread rating requirements of 75 or less in accordance with ASTM E84.

1.7 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Provide product data on specified products, describing physical and performance characteristics, sizes, patterns and color available.

C. Submit samples under provisions of Division 1 showing full range of colors and pattern available for each type of flooring required..

D. Submit two samples 2-1/2 x 2-1/2 inches in size illustrating color and pattern for each floor material specified.

E. Submit two 2-1/2-inch-long samples of base and stair material for each color specified.

F. Submit manufacturer's installation instructions under provisions of Division 1 - indicate preparation and installation.

G. Product data: provide product data on product characteristic, performance and limitation criteria.

H. Manufacturer Certificate: Certify that products meet or exceed specified requirements.

I. Submit letter of verification from all flooring manufacturers, that the flooring contractor and mechanics are approved for the installation of the flooring material.

J. Provide owner with flooring maintenance guide on each product installed as defined in Division 1.

K. This specification may indicate an approved equal to an item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit cleaning and maintenance data under provisions of Division 1.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

C. The flooring contractor should provide the owner with one container of cleaner recommended by the flooring manufacturer, prior to final acceptance of the floor.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Deliver material in unopened cartons. Store materials for three days prior to installation in area of installation to achieve temperature stability.

B. Maintain minimum temperature of 65 deg. F (18 deg C) in spaces to receive resilient flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation.

C. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

D. Provide ventilation in areas to receive solvent cured materials.

1.10 EXTRA MATERIALS

A. Provide 50 sq. ft. of flooring and 10 lineal feet of base and stair materials of each material specified under provisions of Division 1.

1.11 QUALIFICATIONS

A. Manufacturer: Company specializing manufacturing the product specified in this Section with minimum five years documented experience.

B. Application company specializing in performing the work of this Section with minimum five years documented experience and approval by manufacturer, and Architect.

1.12 REGULATORY REQUIREMENTS

A. Conform and confirm required code rating assembly.

B. Conform to applicable code for fire resistance rating and surface burning characteristics.

1.13 QUALITY ASSURANCE

A. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

1.14 TECHNICAL SERVICES

A. Floor manufacturer shall provide technicians to consult with the flooring contractor and mechanics to provide specific installation recommendations on request, and throughout this installation.

B. Manufacturer's representative shall be required to visit the project and review all conditions prior to placement of any finish material. Representative shall respond in writing to the Architect that the floor surface meets or exceeds the requirements set by the floor manufacture is acceptable for the installation of their product.

1.15 JOB CONDITIONS

A. Areas shall be clean, fully enclosed, weather tight, and heated to a minimum of 68 ^{0} F for a minimum of 72 hours, prior to, during and after installation is completed.

B. All floors shall be tested for moisture content using a calcium chloride moisture test and shall not exceed the limits of the product being installed.

C. All subfloor shall be rigid, smooth, flat and level, and free of dirt, grease, wax, paint, and old adhesive residue.

1.16 FLOORING DESIGN

A. The Architect will submit layouts and design for all rooms during the submittal process, and during the selection of colors and patterns. All layout as design by the architect shall be installed per the architect's design. No extra compensation for implementing this work will be allowed.

1.17 PREINSTALLATION CONFERENCE

A. Convene a preinstallation conference a minimal of two weeks prior to commencing work of this Section and under provisions of Division 1. Conference shall be before any work is to be performed and the second meeting before the final installation of the flooring material. Architect to be present to review all conditions prior to any work under this section.

1.18 WARRANTY

A. Provide a seven-year full coverage warranty on the flooring and its products, and a seven-year full coverage warranty on the installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering Vinyl Flooring Products which may be incorporated in the work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.
2. Forbo Linoleum Inc.
3. Altro Flooring
4. Karndean
5. Substitutions: Under provisions of Section 01 00 10.

2.2 SOLID VINYL PLANK FLOORING

A. Van Gogh Wood by Karndean noted as VWP on room finish schedule. Color selection by architect from available products within this category. Product Size 48” x 7”.

2.3 INSTALLATION

A. Installation: Install all flooring in workmanlike manner in strict accordance with manufacturer's approved installation instruction using all required adhesives.

2.4 MANUFACTURER - FLOOR LEVELER

A. Dependable deep rock skim coat.

2.5 ACCEPTABLE MANUFACTURERS - BASE MATERIALS

A. Armstrong.

B. The Johnson Rubber Company.

C. Azrock Industries, Inc.

D. Substitutions: Under provisions of Division 1.

2.6 BASE MATERIALS

A. Base: FS SS-W-40, Type 2 vinyl; 4 inch high; 1/8 inch thick; top set coved and toeless and cove; solid color as selected by Architect.

B. Base Accessories: Premolded end stops and external corners, of same material, size, and color as base.

2.7 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Edge Strips; Vinyl; 1-inch-wide x 1/8 inch thick; finish and color as selected by Architect.

D. Sealer and Wax: Types recommended by flooring manufacturer.

E. Screw down edge stirs: 16-gauge mat finish 1" wide with tampered proof screw at 8" on center.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Require Installer to inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance. Confirm all existing adhesives have been completely removed before installation.

B. Inspect existing floor surfaces for acceptability of levelness, moisture content, and other critical factors. Verify that surfaces are smooth and flat with maximum variation of 1/8 inch in 10 ft., and are ready to receive work. Provide Architect with written confirmation of acceptance of floor surface prior to installation.

C. Before starting work, ensure that the environment and site conditions are suitable for application and proper curing.

D. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Completely prepare surfaces walls and floors in accordance with manufacturer's printed instruction. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. It is essential that moisture tests be taken on all concrete floors. Verify concrete substrate is dry enough to receive the flooring in accordance with the Resilient Flooring Industry calcium chloride test procedure. RFI standard is a maximum of 3 pounds of water emission per 24 hours / per 1,000 Sq. Ft.

C. Installation of all flooring material shall not commence until all procedures as recommended by each floor manufacturer has been achieved and accepted by the installer. All surfaces must be inspected prior to material installation and surface has been verified by the product manufacturer that the floor surface meets the requirements set by their installation specifications.

D. Apply, trowel, and float filler to leave a smooth, flat, hard surface.

E. Apply primer to surfaces as required by manufacturer.

F. Vacuum clean substrate.

G. Prohibit traffic from area until filler is cured.

3.3 INSTALLATION - TILE MATERIAL

A. Install in accordance with manufacturer instructions.

B. Beginning of installation means acceptance of project’s job condition.

C. Mix tile from container to ensure shade variations are consistent.

D. Spread only enough adhesive to permit installation of materials before initial set.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile patterns and minimum number of seams.

G. Install tile to square grid pattern with all joints aligned and with pattern grain alternating with adjacent unit to produce basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

H. Terminate flooring at center line of door openings where adjacent floor finish is dissimilar.

I. Install edge strips at unprotected or exposed edges, and where flooring terminates.

J. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

K. Install feature strips, edge strips, and floor markings where indicated. Fit joints tightly.

L. Architect to approve designed layout prior to installation.

3.4 INSTALLATION - BASE MATERIAL

A. Fit joints tight and vertical. Maintain minimum measurement of 48 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends use premolded units.

C. Install base on solid backing. Bond tight to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.5 CLEANING

A. Cleaning prior to the floor installation as recommended by manufacturer.

B. Upon completion of the approved floor surface, thoroughly wash and clean the floor surface as per the recommendation of the floor manufacturer, prior to the installation of any floor sealer or wax.

3.6 SEALING AND WAXING FOR VCT FLOORING

A. Upon completion of installation, follow manufacture's written instruction for cleaning, sealing and waxing.

1. Seal floor as recommended by manufacturer and Owner.

2. Apply a minimum of three or as many as five coats of wax of the type as recommended by the manufacturers.

3.7 SEALING AND WAXING FOR FLOORING

A. Upon completion of installation, follow manufacture's written instruction for cleaning, sealing and waxing.

1. Seal floor as recommended by manufacturer and Owner.

2. Apply a minimum of three or as many as five coats of wax of the type as recommended by the manufacturers.

3.8 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

3.9 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean, seal, and wax floor and base surfaces in accordance with manufacturer's instructions.

3.10 FINAL FINISHES

A. All floor materials shall receive final floor finishes as required and recommended by each floor manufacturer.

3.11 EXTRA STOCK

A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

1. Tile Flooring: Furnish not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.

END OF SECTION

SECTION 09 81 16

INTERIOR PARTITION INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Provide glass fiber acoustical insulation for interior partitions as indicated in building plans

1.3 RELATED SECTIONS

A. Section 07 21 00 - Mineral Wool Insulation.

B. Section 07 21 16 - Glass Fiber Batt Insulation.

C. Section 07 21 18 - Glass Fiber Blanket Insulation.

D. Section 05 40 00-Metal Framing.

E. Section 09 29 00-Gypsum Board Systems.

F. Section 09 10 00-Metal Support Systems.

G. All Sections as required.

1.4 SUBMITTALS

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

B. Product Data: Submit product characteristics, performance criteria, and limitations, including installation instructions.

C. Sustainable Design: Submit manufacturer’s sustainable design certifications as specified with each product.

D. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.5 QUALITY ASSURANCE

A. Mock-Up: If requested, provide a mock-up of materials proposed for use for review of workmanship. Accepted mock-ups may remain in place.

B. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing work of this section. Agenda shall include materials proposed for use, sequence of construction and coordination with installation of adjacent and covering materials.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in original packages, containers, or bundles bearing the brand name and manufacturer's identification.

B. Storage: Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling.

C. Handling: Handle using procedures recommended by the manufacturer for materials and personnel.

D. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

E. Store and handle materials in compliance with manufacturers recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 WARRANTY

A. Provide manufacturer's standard limited warranty against manufacturing defects.

PART 2 - PRODUCTS

2.1 MANFACTURER

A. Basis-of-Design Manufacturer: Owens Corning Insulating Systems, LLC, Toledo, OH 43659; www.owenscorning.com.

2.2 ACOUSTIC BLANKET INSULATION (SOUND ATTENUATION BATTS)

A. Type: Unfaced glass-fiber acoustical insulation, complying with ASTM C665, Type I.

1. Thickness: 3 1/2 inches (89 mm).
2. Thickness: 2 1/2 inches (64 mm).
3. Width: 16 to 24 inches (406 to 609 mm).
4. Length: 96 inches (2438 mm).

B. Surface Burning Characteristics: ASTM E84.

1. Maximum flame spread: <25.
2. Maximum smoke developed: <50

C. Combustion Characteristics: Passes ASTM E136.

D. Fire Resistance Ratings: Part of ASTM E119 fire tested wall assemblies.

E. Sound Transmission Class: ASTM C423, STC based on manufacturer's published data on thickness and wall assembly.

F. Dimensional Stability: Linear Shrinkage less than 0.1%

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify mechanical and electrical services within walls have been tested and inspected.

B. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's installation instructions. Do not use unfaced insulation in exposed applications where there is potential for skin contact and irritation. Friction-fit blanket insulation in place, until the interior finish is applied. Install batts to fill entire stud cavity, with no gaps, voids, or areas of compression. If stud cavity is less than 8 feet in height, cut lengths to friction fit against floor and ceiling tracks. Walls with penetrations require that insulation be carefully cut to fit around outlets, junction boxes, and other irregularities.

B. Where walls are not finished on both sides or where insulation does not fill the cavity depth, install supplementary support to hold product in place.

C. Where insulation must extend higher than 8 feet, provide temporary support to hold product in place, until finish material is applied.

3.3 PROTECTION

A. Protect installed insulation from damage due to weather and physical abuse until protected by permanent construction.

END OF SECTION

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified under other Sections.

B. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available. The Architect will NOT be limited to the amount of selected colors for rooms and all building surface any where throughout the entire project.

1. Painting includes field-painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Painting is not required on refinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1. Prefinished items **not** to be painted include the following factory-finished components.
   a. Architectural woodwork and casework.
   b. Finished mechanical and electrical equipment.
   c. Light fixtures.
   d. Acoustical material.
   e. Toilet compartment enclosures.
   f. Electrical panels.
2. Concealed surfaces **not** to be painted include wall or ceiling surfaces in the following generally inaccessible areas:
   a. Furred areas.
   b. Utility tunnels.
   c. Pipe spaces.
   d. Duct shafts.
3. Finished metal surfaces **not** to be painted include:
   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper.
   e. Bronze.
   f. Brass.
4. Operating parts **not** to be painted include moving parts of operating equipment.

D. Labels: **Do not** paint over Underwriters Laboratories, Factory Mutual or other code required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry Work.
B. Section 08 11 12 - Standard Steel Frames.
C. Section 08 21 10 - Flush Wood Doors.
D. Section 07 92 00 - Joint Sealers.
E. Section 09 29 00 - Gypsum Board System.

1.4 REFERENCES

A. ANSI/ASTM D16 - Definitions of terms relating to paint, varnish, lacquer and related products.
B. ASTM D2016 - Test method for moisture content of wood.

1.5 DEFINITIONS

A. Conform to ANSI/ASTM D16 for interpretations of terms used in this section.
B. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.6 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
B. Product data for each paint system specified.
    1. Provide the manufacturers technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
    2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
    3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
C. Samples for initial color selection in the form of manufacturers color charts.
    1. The Architect will furnish color selections through the use of a finish schedule. This schedule shall indicate the specified finish number and name. This contractor shall be responsible for verification of the name and number are correct. If a discrepancy is found this contractor shall be responsible for notifying the architect of the discrepancy via the general contractor for direction prior to proceeding with the implementation of this work.
    2. Submit five actual color sample of each color as selected to the Architect for each surface for which the paint is to be used.
    3. The Architect shall not be limited to the number of selected colors for any one space or the entire project.
D. This specification may indicate an approved equal to an item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.7 QUALITY ASSURANCE

A. Product Manufacturers: Companies specializing in manufacturing quality paint and stain and finish products with five years experience.

B. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.

1. Applicators - Companies specializing in commercial painting and finishing with minimum of five years documented experience and approved by product manufacturing.
2. Proposed applicators for this work must be approved by the Architect, prior to commencing with any work under this Section.

C. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

D. Review other sections in which primers are to be provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Confirm compatibility with fire retarded treatment chemicals.

E. Notify the Architect of problems anticipated with the process or using the materials specified.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturers name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturers stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F. (7 degrees C.). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

C. Deliver, install and protect product to site under provisions of Division 1.

D. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.9 JOB CONDITIONS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C).

C. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C).

D. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F (3 degrees C) above the dew point; or

to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

E. Provide lighting level of 80 ft. Candles measured mid height at substrate surface.

1.10 REGULATORY REQUIREMENTS

A. Conform to Rhode Island State Building Code and Rhode Island Fire Safety Code for flame/fuel/smoke rating requirements for finishes.

1.11 PRE-INSTALLATION CONFERENCE

A. Convene a preinstallation conference a minimal of two weeks prior to commencing work of this Section and under provisions of Division 1. Architect to be present to review all conditions prior to any work under this section.

1.12 COLOR APPROVAL

A. After the completion of the first finish coat, (not primer coat) the color shall be reviewed by the architect for rendition. If the Architect finds the color selected to be unacceptable or that the incorrect color has been applied, the architect shall have the right to change or modify the color selection and or location at no charge to the project.

1.13 EXTRA STOCK

A. Provide a one-gallon container of each color and surface texture to Owner.

B. Label each container with color, texture and room locations in addition to the manufacturer's label.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following

1. The Sherwin-Williams Company (S-W).
2. Benjamin Moore and Co. (Moore)
3. Substitution per Division 1.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

B. Material Quality: Provide the manufacturers best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturers product identification will not be acceptable. Unspecified materials found to be unacceptable on the job shall be removed at the expense of the trades person inclusive of any and all necessary repairs to the surfaces on which this material has been applied.

1. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
2. Coatings: Good flow and brushing properties; capable of drying or curing free of streaks or sags.
3. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated not required to achieve the finishes specified of residential quality.
4. Proprietary Names: Use of manufacturers proprietary product names to designate colors or materials is not intended to imply that products named are

required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturers material data and certificates of performance for proposed substitutions.

C. Colors: Provide color selections made by the Architect from the manufacturers full range of standard colors.

2.3 PRIMERS

A. Primers: Provide the manufacturers recommended factory-formulated primers that are compatible with the substrate and finish coats indicated.

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

1. Synthetic. Rust-Inhibiting Primer: Quick-drying, rust-inhibiting primer for priming ferrous metal on the exterior under full-gloss and flat alkyd enamel and on the interior under flat latex paint or odorless alkyd semigloss or alkyd gloss enamels:
   a. S-W: Kem Kromik Universal Metal Primer B5OZ.
2. Alkyd-Type Zinc Chromate Primer: Primers used for priming ferrous metals on the exterior under high gloss alkyd enamels.
   a. S-W: Kem Kromik Universal Metal Primer B50Z.
3. Galvanized Metal Primer: Primer used to prime interior and exterior zinc-coated (galvanized) metal surfaces:
   a. S-W: Galvite H5 B5OWZ30.
4. Latex-Based Interior White Primer: Latex based primer coating used on interior gypsum drywall under a flat latex paint or an alkyd semigloss enamel.
   a. S-W: Prep Rite 200 Latex Wall Primer B28W200
   b. Moore: Moore's Latex Quick-Dry Prime Seal #201.
5. Ferrous Metal Primers: Synthetic, quick-drying, rust-inhibiting primers, for priming ferrous metal on the exterior under full gloss and flat alkyd enamel and on the interior under flat latex paint or odorless alkyd semigloss or alkyd gloss enamels:
   a. S-W: Kem Kromik Universal Metal Primer B5OZ.

2.4 UNDERCOAT MATERIALS

A. Undercoat Materials: Provide the manufacturers recommended factory-formulated undercoat materials that are compatible with the substrate and finish coats indicated.

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

1. Interior Enamel Undercoat: Ready-mixed enamel for use as an undercoat over wood and hardboard under an odorless alkyd semigloss enamel or full gloss alkyd enamel.
   a. S-W: Prep Rite Wall and Wood VOC-Complying Primer B49WZ2.
   b. Moore: Moore's Alkyd Enamel Underbody #217.
2. Interior Enamel Undercoat: Ready-mixed enamel for use as an undercoat over a primer on ferrous metal or zinc-coated metal under an alkyd semigloss enamel or full-gloss alkyd enamel:
   a. S-W: Pro Mar Alkyd Semi-Gloss VOC-Complying B34WZ1101.

2.5 INTERIOR FINISH PAINT MATERIAL

A. Finish Paint: Provide the manufacturers recommended factory-formulated finish-coat materials that are compatible with the substrate and undercoats indicated.

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

1. Interior, Flat, Latex-Based Paint: Ready-mixed, latex-based paint for a flat finish.
   a. S-W: Pro Mar 200 Latex Flat B30W200.
   b. Moore: Regal Wall Satin #215.

2. Interior, Semi-Gloss, Latex-Based Paint: Ready-mixed, latex-based paint for a flat finish.
   a. S-W: Pro Mar 200 Latex Semi Gloss B31W200.
   b. Moore: Regal Aqua Glo 333.
3. Interior, Semigloss, Odorless Alkyd Enamel: Semigloss, low-odor, alkyd enamel.
   a. S-W: Pro Mar Alkyd Semi Gloss VOC-Complying B34WZ1101.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.
   1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
   2. Start of painting will be construed as the Applicators acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Plaster and Gypsum Wallboard: 12 percent
   2. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016.

E. Beginning of installation means acceptance of existing surfaces and substrate, and any repair will become the responsibility of this trades person.

3.2 SURFACE PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
   1. Correct minor defects and clean surfaces which affect work of this Section.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's Instructions for each particular substrate condition and as specified.
   1. Existing surfaces previously painted: Scrape and sand all existing surfaces that have been Previously painted interior and exterior. Remove all projections, loose paint, paint buildup, check all cracks for tightness and remove all loose material, paint, etc. Patch as required to establish a smooth surface with all patching material flush with existing paint to remain and ready to receive new paint.
   2. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing about anticipated problems using the specified finish-coat

material with substrates primed by others.

3. Interior Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
   a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, underside, and backside of wood, including cabinets, counters, cases, and paneling.
4. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).
   a. Blast steel surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 10.
   b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.
5. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and Bleach. Rinse with clean water and allow surface to dry.
6. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or High pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following.
7. Plaster Surfaces: Fill hairline cracks, small holes, imperfections and all unacceptable plaster surface finishes with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
8. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings are evident, remove by wire brushing or sand blasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts and similarly cleaned. Spot prime paint after repairs.
9. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
10. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods. Apply coat of etching primer.

3.3 MATERIAL PREPARATION

A. Carefully mix and prepare paint materials according to manufacturer's directions.
   1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
   2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
   3. Use only thinners approved by the paint manufacturer and only within recommended limits.

B. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.4 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.
B. Repair damage to other surfaces caused by work of this Section.
C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
D. Remove empty paint containers from site.

3.5 APPLICATION

A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
   1. Paint surface treatments, and finishes are indicated in the schedules.
   2. Provide finish coats that are compatible with primers used.
   3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
   4. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
   5. The term exposed surfaces includes areas visible when permanent or built-in fixtures, connector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
   6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture.
   7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
   8. Paint exposed duct work in areas as indicated on plans.
   9. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
   10. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
   11. Prime and finish paint interior door tops, bottoms and edges.
   12. Sand lightly between each succeeding enamel or varnish coat.
   13. Omit primer on metal surfaces that have been shop-primed and touch-up painted.
   14. Paint both sides and all edges of plywood backboards for electrical and telephone equipment before installing equipment.
   15. Replace identification markings on mechanical and electrical equipment when painted accidently.
   16. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.
C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
   1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other

applicators according to the manufacturer's directions.

1. Brushes: Use brushes best suited for the material applied.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

E. Minimum Coating Thickness: Apply materials no thinner than the manufacturers recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

F. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.

G. Mechanical items to be painted include, but are not limited to, the following:

1. Piping, pipe hangers, and supports.
2. Insulation.
3. Supports.
4. Accessory items.
5. Exposed ductwork.
6. Except where items are prefinished.

H. Electrical items to be painted include, but are not limited to, the following:

1. Conduit and fittings.

I. Color code equipment, piping, conduit and exposed ductwork in accordance with requirements indicated. Color band and identify with flow arrows, names and numbering.

J. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

K. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

L. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.6 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:

1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:
   a. Quantitative materials analysis.
   b. Abrasion resistance.
   c. Apparent reflectivity.
   d. Flexibility.
   e. Washability.
   f. Absorption.
   g. Accelerated weathering.

h. Dry opacity.
i. Accelerated yellowness.
j. Recoating.
k. Skinning.
l. Color retention.
m. Alkali and mildew resistance.

3. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

3.7 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.
2. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.8 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.9 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated.

B. Plaster and Gypsum Drywall:

1. Satin/Semi Gloss Finish: 2 Finish Coats over prime coats.
   a. Primer: Interior, flat, latex-based paint: Sherwin-Williams Prep Rite 200 Latex Primer B28W200.
   b. Second Coat & Third Coat: Interior Latex Base Paint: Sherwin-Williams Pro Mar 200 Latex Semi-Gloss Enamel B31W200.

C. Gypsum Wallboard (Special Finish Paint):

1. Texture Spray Coating Finish: 1 Coat over Latex sealer.
   a. Primer: Latex Sealer: Sherwin-Williams Prep Rite 200 Latex Primer B28W200.
   b. Second Coat: High Build Texture Spray Coating (medium Texture): Sherwin Williams (Trioko Plex Rough).

D. Gypsum Wallboard (Glazed Paint)

1. Interior Polyester Epoxy in Semi Gloss Finish: 2 Finish Coats over prime coat.
   a. Prime Coat: Primer Moore's: Sherwin-Williams Prep Rite 200 Latex Primer B28W200.
   b. Second and Third Finish Coat: Water Based Epoxy: Sherwin-Williams Water Based Catalyzed Epoxy Semi Gloss B70-200 Series.

E. Painted Woodwork, Hardboard and Doors:

1. Semigloss Enamel Finish: 2 Finish Coats over Prime Coat

a. Undercoat: Interior enamel undercoat: Sherwin-Williams VOC-Complying Alkyd Wall and Wood B49WZ2.
b. First and Second Finish Coats: Interior, semigloss, odorless: Sherwin-Williams Pro Classic HS Alkyd Semi Gloss B34Z.

2. Full-Gloss Enamel Finish: Three coats.
a. Undercoat: Interior enamel undercoat: Sherwin-Williams Prep Rite Wall and Wood VOC-Complying B49WZ2.
b. First and Second Coats: Gloss alkyd enamel: Sherwin-Williams Industrial Enamel VOC-Complying B54Z.

F. Clear Finish Wood Doors:
1. Satin/Semi Gloss Finish as selected: 3 Coats
a. Three Coat System: Sherwin-Williams Wood Classics Varnish Satin/Semi Gloss A67.

G. Ferrous Metal:
1. Semigloss Enamel Finish: Two coats over primer with total dry film thickness not less than 2.5 mils.
a. Primer: Synthetic, quick-drying, rust-inhibiting primer: Sherwin-Williams Kem Kromik Universal Metal Primer B50Z.
b. Finish Coat: Interior, semigloss, odorless, alkyd enamel: Sherwin-Williams Pro Classic HS Int. Alkyd Semi Gloss B34Z.

H. Zinc-Coated Metal:
1. Semigloss Finish: Two coats over primer, with total dry film thickness not less than 2.5 mils.
a. Primer: Galvanized metal primer: Sherwin-Williams DTM Acrylic Primer/Finish B66W1.
b. Finish Coat: Interior, semigloss, odorless, alkyd enamel: Sherwin-Williams Pro Classic HS Interior Alkyd Semi Gloss B34Z.

I. Aluminum
1. Soft Gloss Finish: 2 Finish Coats over Prime coat.
a. Prime Coat: Corrosion Resistant Primer: Sherwin-Williams DTM Acrylic Primer/Finish B66W1.
b. First and Second Finish Coats: Vinyl Acrylic Latex: Sherwin-Williams Pro Mar 200 Latex Eggshell B20W200.

J. Stained Woodwork:
1. Stained-Varnish Rubbed Finish: 3 finish coats over stain plus filler on open-grain wood. Wipe filler before applying first varnish coat.
a. Stain Coat: Sherwin-Williams Wood Classics Interior Stain A48.
b. Filler: Sherwood Paste Wood Filler D70.
c. Second Coat: Sherwin-Williams Fast Dry Oil Varnish A66-300.
d. Third Coat: Sherwin-Williams Fast Dry Oil Varnish A66-300.

END OF SECTION

DOCUMENT 10 11 00

VISUAL DISPLAY BOARDS

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 SECTION INCLUDES

A. This Section includes the following types of visual display boards.

1. Marker boards.

2. Miscellaneous accessories.

1.3 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 09 29 00 - Gypsum Board Systems

C. All Sections as required

1.4 SUBMITTALS

A. General: Submit the following in accordance with Division 1 "Submittals" Section.

B. Product Data. Provide manufacturer's product data for each type of visual display board specified. Include manufacturer's data substantiating that all visual display board materials comply with requirements indicated.

C. Shop Drawings: For each type of visual display board required, including dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length. Include sections of typical trim member. Show anchor, grounds, reinforcement, accessories, layout, and installation details.

D. Samples for Verification: Of the following products, showing color and texture or finish selected. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected. Prepare Samples from the same material to be used for the Work.

E. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company's negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder's attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the manufacturer for both installation and maintenance of the type of board required for this Project.

B. Source Limitations: Obtain visual display boards through one source from a single manufacturer.

C. Design Criteria: the drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the specific type and model indicated. Other visual display boards having equal performance characteristics by other manufacturers may be considered provided that deviation, in dimensions and profiles are minor and do not change the design, concept or intended performance as judged by the architect. The burden of proof of equality is on the proposer.

D. Fire-Test-Response Characteristics.- Provide boards with the following surface burning characteristics as determined by testing assembled materials composed of facing, and backings identical to those required in this Section per ASTM E 84 by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify board with appropriate markings of applicable testing and inspecting agency.

1. Flame Spread: 75 or less.
2. Smoke Developed: 450 or less

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify-field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication Schedule with construction progress to avoid delaying the Work.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.
2. Established Dimensions: Where field measurements cannot be made without, delaying the work, establish dimensions and proceed with fabricating boards without field measurements. Coordinate wall construction to ensure actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. General Warranty: The special porcelain enamel chalkboard warranty specified in this Article shall not deprive the Owner of other rights the Owner, may have under other provisions of the contract documents, and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Porcelain Enamel Chalkboard Warranty- Furnish the manufacturer's written warranty agreeing to replace **porcelain** enamel chalkboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, provided the manufacturer's instructions with regard to handling, installation protection, and maintenance have been followed.

1. Warranty Period, 50 years

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products may be incorporated in the work include, but are not limited to, the following:

1. Polyvision
2. Carolina Chalkboard
3. Claridge
4. Substitution per Division 1.

2.2 MATERIALS

A. Porcelain Enamel Markers: Provide balanced high-pressure laminated porcelain enamel marker and chalk-boards of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: Provide face sheet of 24-gauge enameling grade steel. Coat the exposed face and exposed edges with a 2-coat process consisting of primer/ground coat and color cover coat, and the concealed face with a 2-coat process consisting of primer/ground coat and spray coat, of silica. Fuse cover and ground coats to steel at the manufacturer's standard firing temperatures, but not less than 1200 deg F (649 C).
2. Core: For single panels, provide the manufacturer's standard 7/16-inch thick, fiberboard core material.
3. Backing Sheet-. Provide the manufacturer's standard 0.005-inch-thick aluminum sheet backing.
4. Laminating Adhesive: Provide the manufacturer's standard moisture-resistant thermoplastic-type adhesive.
5. Color: Provide colors selected by Architect from manufacturer's complete range of options. More than one color may be required.

2.3 FIXED MARKER UNITS

A. Fixed Marker board: “LCS Deluxe Porcelain Whiteboards series units integral chalk tray and end plates, or equivalent, in sizes as indicated in plans with fixed display rail with cork insert.

1. 2 Units LCS2034R @ Offices 203 and 204
2. 2 Units LCS2046R @ Copy 202, Conference 212, Classroom 210
3. 1 Unit LCS2410R @ Classroom 210

2.4 FABRICATION

A. Porcelain Enamel boards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, water proof adhesive.

B. Assembly - Provide factory-assembled board and units in single units without joints and in sizes as indicated on drawings, unless field-assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
2. Provide manufacturer's standard butt type vertical joint system between abutting sections of marker boards, with concealed vertical spline without exposed trim.

C. Marker board and Cork board to be assembled as one unit. Provide all trim and accessories for this application.

2.5 FINISHES

A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish designations prefixed by "AA”'conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class II, Color Anodized Finish: AA-.MI2C22A32/A34 (Mechanical Finish. nonspecular as fabricated: Chemical Finish- etched, Medium matte; Anodized Coating.- Architectural Class II, Integrally colored or electrolytically deposited color coating 0.010 mm or thicker). Color: Satin Anodized (clear).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.

1. Surfaces shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of boards.

2. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, pre-fit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install units in locations and at mounting height as indicated on drawings; comply with manufacturer's installation instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.

C. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.3 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.

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the interior and exterior building signage and directional signs. All signs are to be ADA Compliant, raised letters and Braille. Interior signage shall be constructed of matte clear acrylic panels with Pantagraph cut raised letters. Exterior facility Signage constructed of heavy-duty steel to be screened printed with baked enamel finish and reflective sheeting.

B. Signage shall be provided at all spaces or rooms shown on plans.

1.3 RELATED SECTIONS

A. Section 08 80 00 Glazing

B. Section 09 29 00 Gypsum Board Systems

C. All Section as required.

1.4 SUBMITTALS

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

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

C. Color Chart: Manufacturer's FULL Range of available colors.

D. An actual color selected sign of each type specified shall be submitted with the submittal package. Submission shall include a schedule indicating, sign type, copy and other distinct specified requirements.

E. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non-conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: For each separate type of sign required, obtain signs from a single manufacturer.

B. Design Criteria: The Drawings indicate size, profiles, dimensional requirements, and graphics layout of signs and are based on the specific type and model indicated. Signs by other manufacturers may be considered provided that 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.

1.6 DELIVERY, STORAGE & HANDLING

A. Deliver components correctly packed to prevent damage.

B. Store in secure areas, out of weather and protected from work of other trades.

C. Handle per Manufacturer's instructions.

1.7 WARRANTY

A. Provide Manufacturer's standard one-year limited warranty covering manufacturing defects.

B. Manufacturer shall guarantee exterior signage against cracking, fading, or peeling.

PART 2 - PRODUCTS

2.1 MANUFACTURER (INTERIOR SIGNAGE)

A. Innerface Architectural Signage (1-800-445-4796)

B. Substitution as defined under Division 1.

2.2 SINGLE UNIT MODULES

A. Manufacturer's Single Unit Module to comply with ADA requirements indicated for materials, thickness, finish, colors, size, style, spacing, content and position. The following are details for construction:

B. Sign panel is constructed of a face thickness of .080 laminated to a .125 acrylic backer.

C. Sign shall include grade 2 Braille transition of raised copy utilizing raised color or clear “Braille Dots” set into acrylic face.

D. Sign shall have a radius or square corner as requested or require by the architect.

E. Background color of the signage is reversed sprayed on the matte clear acrylic prior to lamination.

F. Colors: Selected from full range of Pantone, Benjamin Moore, or Sherwin Williams paints.

G. Letters to be as large as possible, and submitted to the architect for approval.

2.3 MOUNTING METHOD

A. INTERIOR SIGNAGE

1. Sign to be installed with high bond double faced tape around entire perimeter of the sign unit, and then completely siliconed around all 4 sizes. Silicone shall be neat and wiped clean leaving a smooth, clear blemish free bead.

2. Sign to be mechanically fastened with four (4) #6 x 1" Torx head stainless sheet metal screws with pin in the center. Screws shall be installed utilizing a 3/16" plastic anchor and then completely siliconed around all 4 sizes. Silicone shall be neat and wiped clean leaving a smooth, clear blemish free bead.

3. Signs to be mounted directly onto glazing shall be installed with 3M #4932 VHB vandal resistant tape on the back of the frame assembly. An additional 1/8" black acrylic backplate (without pre-drilled holes) in the same dimensions as the frame is installed on the inside of the glazing, aligned with the sign module to conceal the exposed tape.

2.4 FINISHES

A. Colors: As selected from the Manufacturer's high contrast ADA standards.

B. Surface Texture: Matte, per ADA standards.

2.5 INTERIOR SIGNAGE SIZES

A. All signage shall be manufactured in the following sizes:

1. Size 4 ½" x 7". All room door locations.
2. Size8 ¾" x 8 ¾" All Toilet locations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that mounting surfaces are finished and suitable for installation.

B. Do not install signs until surfaces are acceptable. Notify architect if there are any questions as to suitability of installation surfaces or installation locations.

3.2 INSTALLATION

A. GENERAL: Locate sign units where indicated, using mounting methods in compliance with the manufacturer's instructions.

B. Mounting Heights: To comply with ADA regulations. (see drawings) ADAG Regulations.

C. Installation: install exterior sign post per manufacturer's instructions.

3.3 CLEANING

A. Cleaning and Protection: 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.

END OF SECTION

SECTION 10 28 00

TOILET, BATHROOM AND SHOWER ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. All items herein specified shall be mounted and installed to conform to all ADA , ADAG & and SBC -16 standards, requirements and regulations.

1.2 SECTION INCLUDES

A. The complete installation of all equipment as specified under this section and all required or necessary provisions for it proper and secure installation. This contractor shall confirm all locations and support materials needed for the installation of each unit as specified.

B. This section included the following toilet and shower accessory items:

1. Toilet Tissue Holder
2. Stainless steel framed mirror unit.
3. Soap Dispensers
4. Paper Towel Dispenser
5. Grab bars.

1.3 RELATED SECTION

A. Section 06 10 00 - Carpentry Work

B. Section 09 30 13 - Ceramic Tile

C. All Sections as required.

1.4 SUBMITTALS

A. Product data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gages, profiles, method of mounting, specified options, and finishes.

B. This specification may indicate an approved equal to a item specified or a supplier. However, the subcontractor/contractor is hereby notified that if any other item other than that specified is submitted through the submittal process, that item must contain a full comparison chart to that of the item specified. If a submittal is submitted without the comparison chart, no matter if the company is listed as an equal, the submittal will be returned for non conformance to the specification. Following this process will expedite the submittal. The Architect will not be responsible for any delays or rejections caused by the submitting company’s negligence in following the defined guidelines for submittals. Products not listed as an approved equal must receive approval prior to bid submission. The bidder’s attention is directed for a thorough understanding and adherence to that of specification Division 1, Product Substitution.

1.5 SETTING DRAWINGS

A. Where cutouts are required in other work, provide templates, substrate preparation instructions, and directions for preparing cutouts and for installation of anchorage devices.

1.6 QUALITY ASSURANCE

A. Insert and Anchorage- Furnish inserts and anchoring devices that must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

1.7 PROJECT CONDITION-COORDINATION

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

B. Ensure all recess requirements have been achieved with the general contractor prior to ordering any product. Confirm with the general contractor compliance that all rough openings have met the specified product requirements.

PART 2 - PRODUCT

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the Work include, but are not limited to the following:

1. A & J Washroom Accessories.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co.
6. American Standard
7. Substitution as defines under Division 1 **BURDEN OF PROOF WILL BY THE GENERAL CONTRACTOR**

2.2 MATERIALS-GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22-gage (.034-inch) minimum thickness, unless otherwise indicated.

B. Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16, Castings, ASTM B-30.

C. Cold-rolled, commercial quality ASTM A 366, 20-gage (.040-inch) minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet ASTM A 527, G60. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

E. Mirror Glass Nominal 6.0 mm (0.23 inch) thick, conforming to ASTM C 1036, Type 1, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.

F. Galvanized Steel Mounting Devices: ASTM A 153, hotdip galvanized after fabrication.

G. Fasteners: Screws, bolts, and other devices of same material as necessary unit or of galvanized steel where concealed.

H. Keys: Unless otherwise indicated, provide universal keys for access to toilet accessory units requiring internal-access for servicing, resupply, etc. Provide minimum of six (6) keys to Owner's representative and obtain receipt.

I. Screws and securing hardware shall be “Tamper Resistant TORX Screws. This will pertain to any and all hardware for anchoring of partitions, brackets, and all other necessary equipment.

2.3 PRODUCTS

A. TOILET TISSUE HOLDER: ASI 0030 surface mounted dual roll toilet paper dispenser: Stainless steel, holds two rolls of standard 1800 sheets toilet paper rolls. Top roll automatically drops in place after bottom roll is used up 6" x 12" x 6 ½".

B. MIRROR UNIT: ASI 0620-1830 series mirror. Type 304 stainless steel frame., satin finish. No 1 quality , 1/4" glass mirror electrolytically copper plated w/ 15 year warranty against silver spoilage.

C. PAPER TOWEL DISPENSER: ASI #0210 Satin Stainless steel, dispenses 400 “C” fold or 525 multi fold towels. Door has tumbler lock and piano hinge. Refill indicator.

D. SOAP DISPENSER: Liquid Soap Dispenser, Vertical Tank Type ASI 0347 Fabricate for surface mounting, sized for 40-fluid ounce minimum capacity. Provide stainless steel piston, springs, and internal parts designed to dispense soap in measured quantity by pump action. Provide cover of type 304 stainless steel in No. 4 finish, with unbreakable window type refill indicator. Equip unit with push-type valve for dispensing soap in liquid form.

E. GRAB BARS: Stainless Steel Type, Bradley #832, of the sizes and configuration as indicated on the drawings, Provide grab bars with wall thickness not less than 18 gage (.050 inch).

1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
2. Clearance: 1-1/2 inches clearance between wall surface and inside face of bar.
3. Gripping Surfaces: Manufacturer's standard non- slip texture.
4. Medium-Duty Size: Outside diameter of 1-1/4 inches.

2.4 FABRICATION

A. General: Only a maximum 1-1/2 inch diameter, unobtrusive stamped logo of manufacturer, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except, where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror, backing and support system that will permit rigid, tamper proof glass installation and prevent accumulation of moisture, as follows:

1. Provide galvanized steel backing sheet, not less than 22 gage (.034 inch) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not acceptable filler material.

D. Mirror Unit Hangers: Provide system of mounting mirror units that will permit rigid, tamper proof, and theftproof installation, as follows:

1. One-piece galvanized steel wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

E. FRAMED MIRROR-FRONT MOUNTING: Frame 14 gauge type 304L Stainless Steel, corners welded and ground smooth. Entire frame polished to No. 4 satin finish. 20 Gauge type 304L stainless steel No. 8 mirror polish finish.

PART 3 - EXECUTION AND INSTALLATION

3.1 INSTALLATION

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

B. Secure mirror to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level and square at locations indicated, in accordance with manufacturer's instructions for type of substrate involved.

C. Provide solid blocking required for secure installation of toilet and bath accessories.

D. Secure grab bars to meet structural strength requirements A117.1 (1986).

3.2 CLEANING AND ADJUSTING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION

SECTION 22 00 00 –PLUMBING

PART I -- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

B. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 DEFINITIONS

A. As used in this section, “provide” means “furnish and install”, and “POS” means “Provided under Other Sections”.

B. As used in the drawings and specifications for plumbing work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the plumbing work.

C. "Approved Equal" means any equipment or material, which is approved by the engineer, and equal in quality, durability, appearance, strength, design and performance to the equipment or material originally specified.

D. "Concealed" means hidden, in chases, furred spaces, walls, above ceilings or enclosed in construction.

E. "Contractor and/or Subcontractor" specifically means, the Plumbing Subcontractor working under this Section of the Specification.

F. "Exposed" means visible, in sight, or not installed "concealed" as defined above.

G. “Furnish” or “Provide” means:

1. Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the plumbing work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.

2. To supply, erect, install and connect in complete readiness for operation, the particular work referred to, unless otherwise specified.

H. “Install” means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the plumbing work.

I. “New” means: Manufactured within the past two (2) years and never before used.

J. "Piping" means all piping including fittings, joints, hangers, supports and valves.

K. “Provide” means: “Furnish” and “Install”.

L. "Underground" means piping that is buried exterior to or within the building.

M. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any plumbing item in the drawings or specifications for plumbing work carries with it the instruction to furnish, install and connect the item as part of the plumbing work, regardless of whether or not this instruction is explicitly stated.

N. It shall be understood that the specifications and drawings for plumbing work are complimentary and are to be taken together for a complete interpretation of the plumbing work except that indications on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

1.3 SUMMARY

A. This section addresses materials and methods common to more than one Subcontractor. Refer to the drawings to determine the extent of work required of each individual trade.

1.4 DESCRIPTION OF WORK

A. The building plumbing fixtures will meet the requirements of the American with Disabilities Act (ADA) and the federal Fair Housing Act and Uniform Federal accessibility Standards (UFAS).

B. The work described herein shall be interpreted as work to be done by the Plumbing Subcontractor. Work to be performed by other trades will be specifically referenced to a particular Contractor or Subcontractor.

C. The work under this section shall consist of furnishing all labor, materials, equipment, supervision, transportation, construction, facilities, devices and incidentals necessary to provide complete plumbing systems as hereinafter described and as indicated on the drawings, including, but not limited to the following:

1. Domestic Cold & Hot Water distribution systems:
    a. Provide domestic water for all plumbing fixtures, equipment, and all other systems, equipment, and devices that require domestic water supply.
    b. Building domestic water distribution systems shall be metered and isolated from the municipal water supply in accordance with the municipality's requirements.
    c. The design of building supply and distribution systems shall provide a volume of water at the required flows, pressures and temperatures to ensure safe, efficient and code compliant operation during periods of peak demand.
    d. Interior cold water piping shall be insulated to prevent condensation. Interior hot water piping shall be insulated as required by Code.
    e. Provide a minimum of two exterior freeze proof wall hydrants.
2. Domestic Hot Water:
    a. Dwelling Units: Each dwelling units domestic hot water shall be generated by a hybrid electric air source heat pump water heater sized appropriately to handle the hot water demand. Provide and install all necessary fittings, pipes and connections. Water will be stored at a temperature of 140°F and mixed down to 120°F for domestic use. Each system shall include a thermostatic mixing valve assembly for the 120°F hot water system.
    b. Management Office: Hot water shall be generated by a bank of hybrid electric air source heat pump water heater sized appropriately to handle the hot water demand for the laundry and bathroom. Provide and install all necessary fittings, pipes and connections. Water will be stored at a temperature of 140°F and mixed down to 120°F for domestic use. Each system shall include a thermostatic mixing valve assembly for the 120°F hot water system.
    c. Maintenance Garage: Hot water for the hand sink shall be generated by an instantaneous electric water heater. Discharge shall be set for 120°F.

3. Domestic Hot Water Re-circulation (if required):
    a. Pumps shall be all bronze, centrifugal type, close coupled, with side suction as manufactured by Bell and Gossett Company, Taco Heaters, Incorporated, Thrush or approved equal. Pump shall be in line type with valved bypass. Motor shall be single phase, 60 hertz AC.

b. Pump shall be provided with a manual motor starting switch. Pump operation shall be controlled by an immersion type aquastat set to start pump and stop pump at selected settings. This Contractor shall provide all control wiring.
c. Recirculating pump, taco 009. Non-ferrous baffle, bronze casing, non-metallic impeller, ceramic shaft, 125 psi pressure rating, 230 degree max. Temp. Rating, 1/2hp @ 3250 rpm, 20 amp rating, 115v, 60hz, 1 phase. 2 gpm @ 20' head.

4. Sanitary Waste & Vent Systems:
   a. Provide sanitary waste and vent systems for all plumbing fixtures, floor drains, equipment, and all other domestic waste producing equipment, and devices that are required by Code to discharge into the sanitary sewer.
   b. Waste and vent systems shall be designed using fixture drain loads established by Code and provide proper operation during periods of peak demand.
   c. All new waste lines shall be tested to insure proper operation of all new waste systems.
   d. Install floor drains and drip pans in all laundry rooms and at water service entrance. All floor drains to have trap primer units and piped cold water..

1.5 CODES, ORDINANCES AND PERMITS

A. All materials and workmanship shall comply with the latest editions of all applicable Codes, Local and State Ordinances, Industry Standards and Regulations.

B. Where the contract documents indicate more stringent requirements than the following codes and ordinances, the contract documents shall take precedence.

C. In the event of a conflict with Codes, the most stringent requirements shall apply.

D. The Plumbing Subcontractor shall notify the Architect/Engineer of any discrepancies between the Contract Documents and applicable Codes, Standards, etc.

E. File all documents, pay all fees and secure all permits, inspections and approvals necessary for the work of this section.

F. The following Codes, Standards and References shall be utilized as applicable:

1. Rhode Island Fuel Gas & Plumbing Code
2. Regulations of the governing Water & Sewer Department
3. State and Local Building Code.
4. Local Codes, Ordinances, Board of Health requirements and Regulations of the town of East Providence, RI.
5. Americans with Disabilities Act (ADA).
6. American National Standards Institute (ANSI).
7. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
8. American Society of Mechanical Engineers (ASME).
9. American Society of Testing Materials (ASTM).
10. American Welding Society (AWS).
11. Commercial Standards, U.S. Department of Commerce (CS).
12. Department of Environmental Protection (DEP).
13. Environmental Protection Agency (EPA).

14. Factory Mutual (FM).
15. Industrial Risk Insurers (IRI).
16. Insurance Services Organization (ISO).
17. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS).
18. National Electric Code (NEC).
19. National Electrical Manufacturers Association (NEMA).
20. National Fire Protection Association (NFPA).
21. Occupational Safety and Health Administration (OSHA)
22. State Department of Public Safety.
23. Underwriters' Laboratories, Inc. (UL).
24. International Residential Code
25. International Energy Conservation Code
26. Attached Reference Materials

1.7 SHOP DRAWINGS AND PRODUCT DATA

A. SUBMITTALS: Submit shop drawings, manufacturers data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication, or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable industry, and technical society publication references, and other information necessary to establish contract compliance of each item the Contractor propose to furnish.

B. Submit in accordance with Division 1.

C. It is the intent of these specifications that all equipment, materials and workmanship used on this project be in complete conformance with all local, state and national codes, ordinances and standards.

D. Substitutions shall conform to the intent stated in above. It is the contractor's responsibility to submit only those items that meet these codes. Should any non-conformance code items be installed, they shall be replaced by the contractor at no additional cost to the owner.

E. The approval of the equipment does not relieve the Subcontractor of responsibility of shop drawing errors related to details, sizes, quantities, wiring diagram arrangements and dimensions which deviate from the Specifications, and/or job conditions as they exist.

F. Refer to General Requirements for the substitutions of equipment and submittal of shop drawings. If apparatus or materials are substituted for those specified, and such substitution necessitates changes in, or additional connections, piping, supports, or construction, it shall be provided. Contractor to assume cost and entire responsibility thereof.

1.8 INSPECTION AND TESTS

A. During the progress of the work it shall be subject to the inspection of the Owner and to such other inspectors, as may have jurisdiction.

B. A final inspection of the installation to determine compliance with the drawing and specifications will be made by the Owner's representative. Work will be checked for quality of

materials, quality of workmanship, proper installation and finished appearance. This Contractor shall provide the services of the project foreman for inspection purposes. The foreman shall remove and reinstall access panels, ceiling tiles, etc., as required to facilitate any inspections required by the Owner's representative.

C. The Contractor shall arrange and conduct operating tests on all equipment. The component parts of systems and the various systems shall be demonstrated to operate in accordance with the requirements and intent of this specification. Any non-complying or defective materials or workmanship disclosed as a result of the inspection and the Contractor shall correct tests promptly.

1.9 RECORD DRAWINGS

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

B. At completion of work prepare a complete set of Record Drawings showing all systems as actually installed. The quantity of design tracings which are made available shall in no way be interpreted as setting a limit to the number of drawings necessary to show the required information. The Plumbing Contractor’s professional draftsperson shall transfer changes and submit three (3) sets of prints to Architect for comments as to compliance with this section.

C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Plumbing Contractor.

D. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

E. All costs related to these requirements shall be paid for by this Subcontractor.

1.10 MAINTENANCE MANUALS

A. Maintenance Manuals: At the completion of the project, turn over to the General Contractor four (4) complete manuals in 3-ring binders, indexed, containing the following:
   1. Complete shop drawings of all material and equipment in Part 2 of this section.
   2. Operation descriptions of all systems.
   3. Names, addresses and telephone numbers of all suppliers of system components.
   4. Preventative maintenance instructions for all systems.
   5. Spare parts list of all system components.
   6. Copies of all valve charts.

1.11 GUARANTEE

A. This Contractor shall obtain in the General Contractor's and Owner's name, the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities which the Contractor

may have by law or other provisions of the Contract Documents. The guarantee shall be for a period of one (1) year minimum from the date of acceptance or final payment.

1.12 STORAGE OF MATERIALS

A. Store materials prior to their installation where designated by the General Contractor. This Contractor shall be responsible for all materials stored and protect all installed equipment from injury or defacement.

1.13 DESIGN BUILD PROVISIONS

A. The Work will be performed based on a Design/Build approach in which the Plumbing Subcontractor provides the engineering needed to satisfy performance criteria and other requirements listed herein. The criteria and requirements are meant to establish the general intent and do not always give specific sizes and types. This proposal must therefore include both system design and engineering services.

B. Shop Drawings shall clearly describe the limits of the Work and identify related work by other trades. Work that the Plumbing Subcontractor requires to be done by other trades should also be noted. Formal coordination drawings will not be produced. Instead each major subcontractor will circulate their drawings to the other trades for review and comments. This will conclude with a coordination meeting in which all conflicts will be identified and resolved.

C. The responsibility to insure that all Work items fit in the space available lies with the Plumbing Subcontractor. The Shop Drawings must in turn include dimensioned details drawn to scale.

D. The Plumbing Subcontractor shall revise the Shop Drawings to include all required changes. Final revised drawings shall be issued prior to starting work.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Pipe and fittings shall be of US manufacture, and shall conform to the latest ASA, ASTM and/or FS Standards.

B. Type A: Type L hard drawn copper tubing with wrought copper sweat fittings joined with approved 95/5 lead free tin antimony solder.

C. Type B: Schedule 40 PVC pipe with ASTM D2665 solvent weld joints and ASTM D2564 solvent cement.

D. Pipe and fittings shall be in accordance with the following:

1. Cold Water	Type A
2. Hot Water Supply	Type A
3. Sanitary, Waste and Vent	Type B
4. Water Heater Relief Valve Discharge	Type A

E. Provide PEX piping thru floor joists wherever possible.

2.2 WATER METER AND BACKFLOW PREVENTOR

A. The building shall have one (1) domestic water meter approved by the governing water department with backflow preventer at the entrance of the domestic water service into the building with the following:

1. Meter shall be approved equal with one-piece bronze case, bronze measuring chamber and ASME flanges to match incoming line size.

2. Meter shall conform with all rules and regulations of all Authorities having jurisdiction and shall comply with the latest Standards of American and New England Water Works Association, obtain approval of the Local Water Department prior to ordering or installation of meters.

3. The meter shall be the remote reading type and shall conform with all rules and regulations of all Authorities having jurisdiction. Obtain approval of the Local Water Department prior to ordering or installation of remote read device. Remote read device shall be mounted in an acceptable location as determined by the Local Water Department.

2.3 VALVES

A. Shut-off valves on cold water and hot water piping 1/2 inch shall be Apollo Series 70-200, solder end, bronze body ball valve, chrome plated bronze ball, 600 psi WOG.

B. Install main accessible shut-off valves for each Suite for water lines.

C. Washing machine shut-off valves shall be equal to Watts series A2C-M1 “Intelliflow” automatic shut-off valve.

D. Shut-off valves on cold water, hot water and hot water recirculation water piping shall be Apollo Series 77-200, solder end, bronze body ball valve, chrome plated bronze ball, 600 psi WOG, full port ball valve.

E. Check valves on cold water, hot water and hot water recirculation piping shall be Nibco Figure No. S-413-W, solder end, bronze body swing check, bronze disc, 200 psi WOG.

F. Drain valves shall be 1/2 inch Apollo Model 78-103 with Watts No. 8A hose connection vacuum breaker, cap with chain of length as required.

G. All ball valves for installation in insulated piping shall have valve extensions to suit installation thickness.

2.4 HANGERS AND SUPPORTS

A. Pipe hangers, pipe anchors, auxiliary steel, wood blocking and fixture supports shall be furnished and set by this Contractor, and he shall be responsible for their proper and permanent location. This Contractor shall be responsible for all core drilling.

B. All piping shall be rigidly supported from the building structure by means of approved hangers and supports. The hanging and support of all piping system shall conform to the ANSI/MSS-SP.58 AND MSS-SP 69 latest edition. This Contractor shall furnish and install all required auxiliary steel required for hanging of piping.

C. All horizontal piping shall be hung with approved adjustable malleable iron pipe hangers. Hangers shall be provided at each joint and at each horizontal branch connection. Hangers shall be adequate to maintain alignment, prevent sagging and shall be placed on or immediately adjacent to the coupling. Horizontal piping shall be braced against

horizontal movement with sway bracing. Supports shall be placed directly beneath horizontal fittings that connect to the stack. Copper tubing 1-1/2 inch and larger shall be supported at ten (10) foot intervals. Copper tubing 1-1/4 inch and smaller shall be supported at six (6) foot intervals. Steel piping shall be supported at six (6) foot intervals for piping 1/2 inch and smaller, at eight (8) foot intervals for 3/4 inch and one inch piping and at ten (10) foot intervals for piping 1-1/4 inch and larger. Plastic piping shall be supported at 4-1/2 foot intervals for 1-1/2 inch piping, at five (5) foot intervals for two inch piping and six (6) foot intervals for piping three inch and larger.

D. All fixtures and equipment shall be supported and fastened in a satisfactory manner and in accordance with fixture manufacturer's recommendations.

E. Wherever wood blocking is required to insure adequate support of fixtures and related piping, it shall be provided by this Contractor and it shall be fire treated.

H. All inserts in new concrete construction shall be capable of developing the full strength of the rod or bolt used in them and shall be either continuous insert type or malleable iron concrete inserts for rod sizes 3/8 inch to 7/8 inch. Continuous inserts shall have anchors every 4 inches and shall extend 1-1/2 inches above the back of the insert and shall hook to provide anchor. All inserts shall be tied to the reinforcing steel rods with wire and properly sized reinforcing rods shall be inserted through the special holes, hooks or brackets provided in or on the inserts to securely anchor insert to the structure.

2.5 SLEEVES, ESCUTCHEONS AND FIRESTOPPING

A. Sleeves shall be furnished and set by this Contractor and he shall be responsible for their proper and permanent location. This Contractor shall be responsible for all core drilling. Core openings shall have link-seal fire-rated penetration closures.

B. This Contractor shall provide steel sleeves at all points where pipes and all other work under his charge pass through masonry, concrete or wood. Sleeves shall have flanges or wings at mind-points to prevent sleeve from slipping through the floor or wall. Pipe sleeves shall be sufficient diameter to provide approximately 1/4 inch clearance around the pipe or the insulation on insulated systems. Sleeves through walls shall end flush with the surface of the walls. Sleeves in floors shall extend one inch above the floor and after installation of piping shall be packed, fire-stopped and made watertight. Sleeves in exterior walls shall have water-stop plates, shall end flush with the surface of the walls, shall have link-seal penetration closures and shall be of a diameter that is compatible with the Link Seal System.

C. Seal the sleeve penetrations with firestopping and smoke stopping systems as manufactured by Dow Corning, Bio-Shield, Rectorseal Metacaulk, 3M, Fyre Putty or equal. Where pipes penetrate fire rated construction, the openings shall be packed with the material and system that shall maintain the integrity of the fire rating as detailed in the UL Fire Resistance Directory.

D. Pipe Sleeves shall be according to the following:

1. Sleeves on pipes passing through masonry or concrete construction shall be scheduled 40 galvanized steel pipe.

2. Sleeves on pipes passing through wood or drywall partitions shall be 16 gauge galvanized steel.

E. Whenever new penetrations to a previously poured slab are required for the installation of floor drains, shower drains, mop receptors, flush floor cleanouts or similar items of

plumbing, these penetrations shall be totally sealed with a fire stop sealant. Sealant shall be Dow Corning fire stop sealant, Catalog No. 2000. Hourly fire rating in hours must be meet the requirements of the slab being penetrated.

G. Provide chrome plated brass escutcheons with set screws for exposed piping in all areas. All escutcheons shall be sized to fit the bare pipe or insulation in a snug and neat manner. They shall be of sufficient size to cover sleeves openings for the pipes and of sufficient depth to cover sleeves projecting above floors. Escutcheons shall be placed on both sides of wall at all pipe penetrations.

H. Seismic Restraints: It is the intent of this seismic specification to keep all plumbing building system components in place during a seismic event.
   1. All plumbing systems must be installed in strict accordance with seismic codes, component manufacturer's and building construction standards. Whenever a conflict occurs between the manufacturer's or construction standards, the most stringent shall apply.
   2. This contractor shall engage a professional structural engineer registered in the jurisdiction of this project if required to review the entire installation to determine all seismic restraint requirements and methods. Contractor shall submit a report outlining the structural engineer’s review as well as seismic restraint shop drawings and supporting calculations prepared by the professional structural engineer for review by the Architect.
   3. Seismic restraints shall be designed in accordance with seismic force levels as detailed in the applicable building code.

2.6 ACCESS PANELS

A. Furnish access panels for access to all concealed parts of the plumbing system that require accessibility such as valves, shock absorbers and cleanouts. Access panels to be installed by others under the appropriate section of the specifications.

B. All access panels shall be located in a workmanlike manner, positioned so that the component can be easily reached and the size shall be sufficient for this purpose (minimum size 12-in. square). Location of access panels will be submitted for approval prior to installation.

C. Access panels shall be prime painted with cam lock, as manufactured by Inland Steel Products Co. Milcor, Miami Carey or Wayloctor or an approved equal. Provide fire rated access panels where required by applicable code. They should be as follows:
   1. Drywall Surfaces: Acudor DW-5040
   2. Masonry Construction: Acudor UF-5000
   3. Plastered Surfaces: Acudor PS-5030

D. Access panel shop drawings shall be submitted to the Architect for approval.

2.7 PLUMBING FIXTURES

A. Plumbing fixtures shall be of the best quality as fabricated by a manufacturer of established reputation.

B. Where required all plumbing fixtures installed shall be ADA and AAB compliant.

C. All fixtures shall have the manufacturer's guarantee label or trademark indicating first quality.

D. All plumbing fixtures shall meet EPA water sense requirements.

E. Water closets: Vitreous china tank type watercloset with concealed cistern and push panel flush system. Waterclosets shall be equipped heavy-duty bowls and seats with heavy-duty mounting supports. Provide a large bore toilet waste pipe with an inspection chamber behind the toilet pan. Toilets shall not exceed 1.28 GPF.

F. Lavatories: Vitreous china center-set wall hung lavatory with low-flow, faucet with thermostatic mixing valve. Locate thermostatic mixing valve as high as possible under sink. Provide water-level monitors; oversized cleanouts and debris trap.

G. Kitchen sinks & faucets: Single bowl 22”x25” stainless steel sink with sink base faucet, low flow gooseneck, ADA compliant lever handles where required and debris trap.

H. Shower units: One-piece seamless acrylic shower unit. Low flow shower head. Refer to Architect’s drawings.

I. Floor drains: Provide a floor drain in all water entrance rooms. Floor drains shall be equipped with trap primers.

J. Provide a pan with water sensor alarm under all washing machines in laundry rooms.

K. All materials specified to be chromium plated shall be thoroughly cleaned and polished before plating and plate shall be heavily, thoroughly and evenly plated, guaranteed not to strip or peel.

L. Where escutcheons are not furnished with plumbing fixtures, this Contractor shall supply them. Fixtures shall meet the requirements for the conservation of hot and cold water as noted in the State Plumbing Code.

M. Each fixture shall be separately trapped, using the type and size of trap required by the Plumbing Code or as specifically denoted otherwise. Unless otherwise specified, faucets and all exposed fittings and pipe shall be chrome plated.

2.8 PIPING ACCESSORIES

A. Furnish and install vacuum reliefs, Watts Regulator Co., or approved equal.

2.9 SHOCK ABSORBERS AND EXTERIOR NON-FREEZE WALL HYDRANTS

A. Maintenance free water hammer arresters shall be furnished and installed at all locations in the water systems where quick acting valves are installed as well as wherever water hammer may occur.

B. Water hammer arresters shall be as manufactured by Josam Manufacturing Company, Jay R. Smith Manufacturing Company or Zurn Systems. Arresters shall be installed at each and every multiple of fixtures or items as listed above and/or as indicated on drawings. Water hammer arresters may serve groups of fixtures. Sizing and placement shall be in accordance with PDI Standard PDI-WH-201 and the manufacturer’s recommendations.

C. Water hammer arresters shall be as follows:

Designation	Fixture Unit Rating	Model
1. SA “A”	1-11	Jay R. Smith 5005
2. SA “B”	12-32	Jay R. Smith 5010
3. SA “C”	33-60	Jay R. Smith 5020
4. SA “D”	61-113	Jay R. Smith 5030
5. SA “E”	114-154	Jay R. Smith 5040
6. SA “F”	155-330	Jay R. Smith 5050

D. Air chambers will not be approved as an equal.

E. Access panels shall be required at shock absorbers.

F. Install lockable “keyed” non-freeze wall hydrants on each side of the building for lawn irrigation.

2.10 FIRE SAFING

A. Where piping passes through fire rated walls, floors and ceilings, provide a fire safing system so as to maintain the integrity of the rated assemblies to the satisfaction of the Architect and the Building Inspector. The fire safing system shall be as manufactured by 3M, Dow, Bio-Fire Shield, or Nelson. Provide manufacturer's details or custom details when there are not manufacturer's details for each condition with a UL listing referenced. Where piping is insulated, pipe insulation shall run continuously through the rated opening. Details shall show the required depth and annular space width requirements and limitations and any packing requirements.

B. Refer to architectural drawings for rated walls and partitions. Where there are no architectural drawings or they do not indicate rated walls and partitions, the following guidelines shall be used. All floors, corridor walls, party walls, mechanical room walls, duct and pipe chase walls, stairwells, trash room and chute walls shall be considered minimum two hour fire rated walls.

C. Products for fire safing of PVC piping shall be Proset System "C" or approved equal.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Prior to the work of this section, this Contractor must ascertain that preceding work has been accomplished in a manner to permit compliance with the level of quality required by this Section.

B. The entire work provided in this specification shall be constructed and finished in every respect in a workmanlike and substantial manner. It is not intended that the drawings shall show every pipe, fitting, and appliance. Furnish all parts as may be necessary to complete the system in accordance with the best trade practices and to be the satisfaction of the Architect, Engineer and General Contractor.

C. This Contractor shall keep other contractors fully informed as the shape, size and position of all openings required for his apparatus and shall give full information to the General Contractor or other contractors sufficiently in advance of the work so that all openings may be built in advance. Furnish and install all sleeves, supports, etc., specified or required.

D. In the case of failure on the part of this Subcontractor to give proper and timely information as noted above, he shall do his own cutting and patching, or have same done by the General Contractor at this subcontractor's expense, but in any case, without extra expense to the Owner and General Contractor.

E. This Contractor shall obtain detailed information from the manufacturer of apparatus as to the proper method of installing and connecting same. He shall also obtain all information from the General Contractor and the other contractors which may be necessary to facilitate his work and the completion of the whole project.

3.2 TESTING PIPING SYSTEMS

A. Test all work in the presence of the Architect/Engineer and/or Owner, Owner's representative and Plumbing Inspector as called for in local codes.

3.3 PROTECTION AND CLEANING

A. Each subcontractor shall be responsible for his work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment, which are not immediately installed after delivery on site. Close open ends or work with temporary covers or plug during construction to prevent entry of obstructing materials.

B. Each subcontractor shall protect work and materials of other trades from damage that might be caused by his work or workman and make good damage thus caused.

C. The premises shall be kept reasonably clean at all times, and rubbish shall be removed as directed by the General Contractor.

D. Upon completion of this work, the Contractor shall clean all fixtures and equipment and replace damaged parts. Upon failure of this Contractor to fulfill his obligation, this work will be taken care of at his expense.

3.4 WORK COORDINATION AND JOB COORDINATION

A. Plumbing equipment shall not be installed in congested and possible problem areas without first coordinating the installation of same with the other trades and the General Contractor.

B. Particular attention shall be directed to the coordination of system with all equipment of other trades installed in and above the ceiling areas. Conflicts in heights and clearance above hung ceilings shall be brought to the attention of the General Contractor for a decision before equipment is installed.

C. Furnish to the General Contractor and other trades all information relative to the position of the plumbing installation that will affect them so that they may plan their work and installation accordingly.

3.5 SUPPLEMENTARY STEEL, CHANNEL AND SUPPORTS

A. Furnish and install all supplementary steel, channels and supports required for the proper installation, mounting and support of all equipment.

B. Supplementary steel and channels shall be firmly connected to building construction in a manner approved by the Architect/Engineer.

C. The type and size of the supporting channels and supplementary steel shall be determined by the Plumbing Subcontractor and shall be sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

D. All supplementary steel and channels shall be installed in a neat and workmanlike manner parallel to the walls, floor and ceiling construction. all turns to be made with 90 degree fittings, as required to suit the construction and installation conditions.

3.6 SLEEVES AND INSERTS

A. Sleeves shall be furnished, set and properly secured in place and at all points where piping passes through masonry or concrete. All sleeves shall be of sufficient diameter to provide 1/4-in. clearance around the pipe.

B. Sleeves through concrete slabs, and interior concrete and masonry walls or partitions

shall be steel pipe. Fire stop annular openings between sleeves and pipes at floor slab passages and make watertight. Galvanized sleeves and copper piping shall not be placed in concrete.

C. Install UL listed and FM approved inserts or other anchoring devices in concrete and masonry construction as required to support piping. Inserts shall be of the adjustable type as manufactured by Carpenter and Patterson, Grinnell, or Fee and Mason.

3.7 INSERTS AND OPENINGS

A. Inserts: Install inserts or other anchoring devices in concrete and masonry construction as required to support piping. Inserts shall be of the adjustable type as manufactured by Carpenter and Patterson, Grinnell of Fee and Mason.

B. Escutcheons: All exposed pipe, uncovered, passing through walls, floors or ceilings shall be fitted with one piece chrome plated brass escutcheons with set screw holding in position. Floor escutcheons to be deep enough to fit over sleeves, fastened to pipe and extending down to floor.

3.8 SANITARY WASTE AND VENT SYSTEMS

A. Furnish and install piping to take wastes from all soil and waste stacks, fixtures, drains and equipment.

B. Unless specifically noted otherwise on the plans, all horizontal piping 3 in. and larger shall be pitched at the rate of 1/8 in. per foot in the direction of the flow. Horizontal sanitary piping smaller than 3” shall be pitched at the rate of 1/4 in. per foot in the direction of the flow.

C. Vent System: Furnish and install piping to vent all stacks, fixtures, traps and appliances. All vent piping shall be concealed where possible with the horizontal pipe pitching back toward fixtures to allow connection to drain. Whether indicated on plan, riser diagram or not, offset vents below the roof to avoid air intakes, equipment, penthouse mansard etc., bring vents through the roof a minimum of 25 ft. away from air intakes, windows, and operable sash and 10 ft. away from other obstructions.

3.9 HOT AND COLD WATER SYSTEMS

A. Furnish and install complete cold, hot and hot water return systems to service all requiring cold or hot water. Cold water piping shall start at the connection to the water main and extend to all fixtures and equipment, including piping, fittings and valves requiring connections. Hot water piping shall extend from the hot water heater to all fixtures and equipment, including piping, fittings and valves. In general, piping shall pitch upward in the direction of flow with each branch and riser separately valved and with 1/2 in. hose end drains on the outlet side of the valve and at all low points in the systems. Install valves for each battery of fixtures and other valves as necessary to isolate all parts of these systems. All valves shall be accessible. Piping shall be concealed in walls, above ceilings or in pipe chases. Do not install piping in areas subject to freezing. Do not install piping in exterior walls.

3.11 CHLORINATION

A. All water lines and water service shall be thoroughly flushed and chlorinated before being put into service. The domestic cold and hot water systems shall be chlorinated and flushed in accordance with the requirements of the State Plumbing Code and Local Inspector.

B. Submit a certificate of compliance when chlorination has been completed stating when

performed, by whom and who witnessed the procedure.

END OF SECTION

SECTION 230000 – MECHANICAL

PART 1: GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

1.2 SUMMARY OF WORK

A. Provide complete functional Heating, Ventilating and Air Conditioning system as shown on Mechanical Construction Documents.

1.3 REFERENCE STANDARDS

A. NFPA Standards

B. ANSI Standards

C. ASME Standards

D. ASTM Standards

E. AWWA Standards

F. ASHRAE Standards

G. SMACNA Standards

H. OSHA Standards

I. NEBB Standards

J. Local Codes and Ordinances

K. Owner’s Insurance Company Requirements

L. Where the contract documents indicate more stringent requirements than the above codes and ordinances, the contract documents shall take precedence.

M. File all documents, pay all fees and secure all permits, inspections and approvals necessary for the work of this section.

1.4 CONTRACT DRAWINGS & SPECIFICATIONS

A. The Contract Drawings are generally diagrammatic and convey the Scope of Work and General Arrangement of apparatus and equipment. The locations of all items shown on the drawings or called for in the specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project and shall have the approval of the Architect and Engineer before being installed. The Subcontractor shall follow drawings in laying out work and shall check drawings of the other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. If directed by the General Contractor, Engineer and/or Architect, the Subcontractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or before proper execution of the work.

B. Specifications: The specifications are intended only to complement the drawings; however, work detailed and/or noted only on the drawings or work described only in the specifications shall all be considered as part of the scope of work.

1.5 CONFLICT BETWEEN PLANS AND SPECIFICATIONS

A. In case of conflict between the contract drawings and specifications, the Engineer shall determine which takes precedence.

1.6 SHOP DRAWINGS AND PRODUCT DATA

A. SUBMITTALS: Submit shop drawings, manufacturers data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication, or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable industry, and technical society publication references, and other information necessary to establish contract compliance of each item the Contractor propose to furnish.

B. Submit in accordance with Division 1.

C. It is the intent of these specifications that all equipment, materials and workmanship used on this project be in complete conformance with all local, state and national codes, ordinances and standards.

D. Substitutions shall be equivalent to specified equipment in all aspects of quality and performance and shall conform to the intent stated above. It is the contractor's responsibility to submit only those items that meet these requirements. Should any non-conforming items be installed, they shall be replaced by the contractor at no additional cost to the owner.

E. The approval of the equipment does not relieve the Subcontractor of responsibility of shop drawing errors related to details, sizes, quantities, wiring diagram arrangements and dimensions which deviate from the Specifications, and/or job conditions as they exist.

F. Refer to General Requirements for the substitutions of equipment and submittal of shop drawings. If apparatus or materials are substituted for those specified, and such substitution necessitates changes in, or additional connections, piping, supports, or construction, it shall be provided. Contractor to assume cost and entire responsibility thereof.

1.7 INSPECTION AND TESTS

A. During the progress of the work it shall be subject to the inspection of the Owner and to such other inspectors, as may have jurisdiction.

B. At completion of the work, Contractor shall submit to the Owner's representative in writing a statement stating: (1) that the work is complete; (2) that the entire installation is in accordance with the specification; (3) that preliminary tests have been made; and (4) that the work is ready for final inspection and test.

C. A final inspection of the installation to determine compliance with the drawing and specifications will be made by the Owner's representative. Work will be checked for quality of materials, quality of workmanship, proper installation and finished appearance. This Contractor shall provide the services of the project foreman for inspection purposes. The foreman shall remove and reinstall access panels, ceiling tiles, etc., as required to facilitate any inspections required by the Owner's representative.

D. The Contractor shall arrange and conduct operating tests on all equipment in the presence of the Owner's representative. The component parts of systems and the various systems shall be demonstrated to operate in accordance with the requirements and intent of this specification. Any non-complying or defective materials or workmanship disclosed as a result of the inspection and the Contractor shall correct tests promptly, and the tests repeated as often as necessary until approved and accepted by the Owner's representative.

1.8 ELECTRICAL EQUIPMENT

A. Electrical components of mechanical equipment and systems, such as motors, factory mounted motor starters, disconnects, and control equipment shall be provided under the related Section of Division 23.

B. Temperature control equipment, including thermostats, zone valves, relays, aquastats, etc. shall be provided under related sections of Division 23. Temperature control wiring not specifically shown on electrical drawings shall be provided under related Section of Division 23.

C. Upon completion of temperature control system wiring, the responsibility of the control system will fall under Division 23.

D. All electrical equipment installed in concealed spaces shall be provided with a hard-wired electrical connection. Plug-type disconnects shall not be allowed in concealed spaces. Equipment provided with plug-in cords shall not have their cords modified.

1.9 OPENINGS IN EXTERIOR WALLS OR ROOF

A. Openings in exterior walls or roof shall be kept properly plugged and caulked at all times, except when being worked on to preclude the possibility of flooding due to storm or other causes. After completion of work, openings shall be permanently sealed and caulked in a manner approved by the Architect.

1.10 GUARANTEE

A. Except as otherwise specified, all work, materials and equipment shall be guaranteed against defects resulting from the use of inferior materials, equipment, or workmanship for one year from the date of final completion of the contract, or from full acceptance by the Owner, whichever is earlier.

B. If, within any guarantee period, repairs or changes to guaranteed work are required as a result of the use of defective materials or equipment, inferior workmanship or work that is not in accordance with the terms of the contract, and upon receipt of notice from the Owner, the following shall be done without expense to the Owner.

C. Place in satisfactory condition in every particular all of such guaranteed work and correct all defects therein.

D. Repair all damage to the building or site/equipment or contents thereof which is the result of the use of defective materials or equipment or inferior workmanship, or of work not in accordance with the terms of the contract.

E. Make good any work or materials, or the equipment and contents of said building or site disturbed in fulfilling any such guarantee.

F. In fulfilling the requirements of the contract or of any guarantee embraced in or required thereby, any work guaranteed under another contract is disturbed, restore such disturbed work to original condition and guarantee such restored work to the same extent as it was guaranteed under such other contract.

G. If upon failure to proceed promptly after notice to comply with the terms of the guarantee, the Owner may have the defects corrected and Contractor and his surety shall be liable for all expenses incurred.

H. This Contractor shall obtain in the General Contractor's and Owner's name, the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities, which the Contractor may have by law or other provisions of the Contract Documents. The guarantee shall be for a period of one (1) year minimum from the date of acceptance or final payment.

1.11 CLEANING OF SYSTEM

A. Thoroughly clean piping, ducts, fixtures and equipment of all foreign substances inside and out before placing in operation. All air handling equipment shall be provided with “construction filters” for use during construction. Once construction is substantially complete and prior to final testing adjusting and balancing, furnish and install new filters for each piece of equipment.

B. If any foreign matter should stop any part of a system after being placed in operation, clean and reconnect system.

C. Remove all covers of interior floor drains and cleanouts, clean of all dirt, concrete traces, etc., then lightly grease and reinstall.

D. Existing HVAC systems which are being tied into or otherwise modified shall be thoroughly cleaned and refurbished prior to being placed back in service.

1. Duct Systems shall be cleaned of all foreign contaminants, dust and debris.
2. Hydronic Systems shall be fully flushed, cleaned, refilled and treated.
    a) Contractor shall test existing system fluid to determine the concentration of freeze-inhibitor in the system prior to drain down.
    b) Refilling of the system shall include freeze inhibitor matching the concentration of the system prior to drain-down.
3. During contractor shall bring to the attention of the owner and engineer any perceived deficiencies in existing systems including but not limited to:
    a) Code deficiencies
    b) Inoperable equipment
    c) Leaking ductwork and/or piping
    d) Missing or deteriorating insulation
    e) Excessive noise

1.12 TEMPORARY OPENINGS

A. Coordinate construction and provide temporary openings in the building as required for the admission of equipment furnished under this Division.

1.13 DEFINITIONS

A. "Piping" includes, in addition to pipe, all fittings, valves, hangers, and other accessories relating to such piping.

B. "Concealed" means hidden from sight in trenches, chases, furred spaces, shafts, hung ceilings, embedded in construction or in crawl spaces.

C. "Exposed" means not installed underground or "concealed" as defined above.

D. "Provide" means furnish and install complete and ready to operate.

1.14 EQUIPMENT DEVIATIONS

A. Where proposals to use an item of equipment other than that specified which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Architect at the Contractor’s expense.

B. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the drawings, furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors,

starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

1.15 ELECTRICAL ROOM REQUIREMENTS

A. Do not install any piping, ductwork or equipment in or through electrical rooms, transformer rooms, electrical closets, telephone rooms or elevator machine rooms, unless piping or ductwork of equipment is intended to serve these rooms. Additionally, no ductwork or piping will be installed above electric panels. If the Contractor violates this requirement, he shall remove and/or relocate all items as required at his expense and to the satisfaction of the Architect.

1.16 COOPERATION WITH OTHER TRADES

A. Give full cooperation to other trades and furnish in writing to the Architect any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. Coordination drawings shall be initiated by this contractor. It this contractor’s responsibility for preparation of project coordination drawings showing the installation of all equipment, piping, ducts and accessories to be provided under Section 230000 of the Specifications.

1. Drawings shall be prepared at not less than 1/4 in. = 1 ft. scale, and shall show building room layouts, structural elements, ductwork and lighting layouts of function. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.
2. A reproducible copy of each drawing prepared shall then be submitted to each Contractor working under Sections 210000, 220000, and 260000, who shall be responsible to coordinate his equipment and systems and shall show these on the drawings submitted.
3. After each Contractor has fulfilled his obligation, he shall return the drawings to the HVAC Contractor. After each drawing has been coordinated between trades, and appropriate revisions made, each trade shall sign each drawing, indicating acceptance of the installation.
4. The HVAC Contractor shall then print the coordination original and these prints submitted through the General Contractor to the architect for review and comment, similar to shop drawings. Comments made on these drawings shall result in a correction and re-submittal of the drawings.

C. Furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.17 PROJECT RECORD DOCUMENTS:

A. Each Contractor shall record clearly, neatly, accurately, and promptly as work progresses the following data:

1. Changes made resulting from change orders or instructions issued by the Architect.
2. Changes in routing made to avoid conflict with other trades or structural conditions.
3. Final location of equipment and panels if different than contract documents.

B. Upon completion of the project submit to the Architect a set of electronic media noting "as built" conditions indicating all variations and deviations of his work from contract documents.

1.18 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

A. Operating Instructions: Provide operating instructions to the Owner's designated representative

with respect to the operation functions and maintenance procedures for all equipment and systems installed. The cost of providing a manufacturer's representative at the site for instructional purposes shall be included in the Contract Price.

B. Maintenance Manuals: At the completion of the project, turn over to the General Contractor four (4) complete manuals in 3-ring binders, indexed, containing the following:

1. Complete shop drawings of all material and equipment of this section.
2. Operation descriptions of all systems.
3. Names, addresses and telephone numbers of all suppliers of system components.
4. Preventative maintenance instructions for all systems.
5. Spare parts list of all system components.
6. Copies of all valve charts.

1.19 PROTECTION

A. Protect all work and material from damage by work and workmen, and accept liability for all damage thus caused.

B. Be responsible for work and equipment until finally inspected, tested, and accepted. Protect work against theft, injury or damage; and carefully store material and equipment received on site, which is not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

C. All openings in stored & installed ductwork shall be covered & sealed when not in use to prevent contamination from dust & debris.

1.20 SCAFFOLDING, RIGGING AND HOISTING

A. Provide scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of material, equipment and apparatus furnished under this division. Remove same from premises upon completion of work.

B. Coordinate propose routing with architect prior to rigging and protect all existing building components against damage.

1.21 MATERIALS AND WORKMANSHIP

A. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Architect shall be furnished.

B. Furnish the services of an experienced foreman who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welder, helpers, and labor required to unload, transfer, erect, connect, adjust, start, operate, and test each system.

C. All equipment and materials shall be installed in strict accordance with the manufacturer’s recommended installation instructions as well as UL Listing instructions and all Local, State and National codes.

1.22 QUIET OPERATION AND VIBRATION

A. Work shall operate under all conditions of load without any objectionable sound or vibration. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or

vibration conditions considered objectionable shall be corrected in an approved manner at no expense to the Owner. Vibration control shall be means of approved vibration eliminators in a manner as recommended by the manufacturer of the eliminators.

1.23 ACCESSIBILITY

A. Assure and be responsible for the adequacy of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of the work. Cooperate with all other trades whose work is in the same space. Such spaces and clearances shall, however, be kept to the minimum size required.

B. Locate all equipment, which must be serviced, operated, adjusted or maintained fully accessible positions. Equipment shall include, but not be limited to, valves, traps, cleanouts, motors, controllers, filters, dampers, starters, coils, fire dampers, smoke dampers and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility, and the engineer shall approve any change.

C. Provide access panels for installation in concrete block walls or gypsum wallboard ceilings and partitions in locations, which require access for service to the items located behind the permanent gypsum wallboard or concrete block finish.

D. Access panels shall be installed where required to gain access to valves, dampers, controls, etc. Panels shall be flush, insulated, contain continuous steel hinge and screwdriver operated latch. Panels shall be rated equal to the assembly that they are being installed in panels shall be UL listed.

E. Access panels located in fire rated partitions shall be fire panels. The frame and panel assembly of these fire panels shall be manufactured under the Factory Inspection Service of the Underwriters' Laboratories, Inc., and shall bear a label reading: "Frame and Fire Panel Assembly, Rating 2 hours. (B) Temperature Rise 30 Minutes, 250° F. Maximum." Rated panels shall be equipped with automatic closing mechanism and be self-latching.

F. Panels shall be provided with screwdriver operated flush cam locks.

G. Panel size shall be 12 inches x 12 inches except furnish a larger size if required to service a particular item. The exact location and size of each access panel shall be reviewed with, and approved by, the Engineer.

H. The exact location and size of each access panel shall be noted on a shop drawing and reviewed with, and approved by, the Architect and Engineer in writing prior to installation.

1.24 CUTTING AND PATCHING

A. Provide all cutting and patching necessary to install the work specified in this division. Patching shall match adjacent surfaces.

B. At floor slabs & wall openings to be cored drilled or cut, contractor shall find and mark on both faces all reinforcing, rebar, conduits, utilities, etc.. by means of x-ray, pach-ometer or prof-ometer. Submit sketch showing locations of all findings and proposed cuts or cores for review.

C. No structural members shall be cut without the approval of the Structural Engineer, and all such cutting shall be accomplished in a manner directed by the Structural Engineer.

1.25 GROUNDING

A. All components of mechanical piping systems shall be properly grounded to building ground. Where ground path is interrupted by non-conductive materials, appropriate bonding or grounding to building ground shall be provided.

1.26 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Architect before work is started. Furnish all necessary sleeves required.

1.27 DEMOLITION

A. Prior to submitting bid, visit site and identify existing conditions and difficulties that will affect work of this section. Demolition work will require careful site examination prior to bidding. No compensation will be granted for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observers.

B. Prior to commencing demolition, contractor shall identify with owner any equipment to be returned to the owner after demolition. All other debris shall be disposed of by this contractor in accordance with all applicable regulations. Any shutdowns required for demolition shall be coordinated with building owner to avoid impact to operations.

C. During demolition, any equipment, ductwork, piping, etc. found to be abandoned shall be demolished. Existing unused connections to existing ducts or piping shall be cut back to the mains and capped accordingly.

D. Under demolition, the following is, in brief, the extent of the work to be performed by the mechanical contractor under this contract.

1. The mechanical contractor shall be responsible for the disconnection and removal of the existing mechanical equipment, ductwork, piping, valves, etc.,in designated areas. Cut & cap piping and ductwork back to mains. Patch all roof and wall penetrations to match existing.
2. This contractor shall protect work against injury or damage; and carefully store material and equipment to be relocated. Open ends of work shall be closed with temporary covers or plugs during storage and construction to prevent entry of obstructing material.
3. All existing HVAC components, including but not limited to ductwork, piping, equipment, controls & accessories, shall be removed from the area of renovation.
4. Coordinate all demolition with other trades to ensure all relevant portions of the system including associated electrical and plumbing components are removed.
5. Refer to drawing plans and notes for additional information.

1.28 TEMPORARY HEAT

A. The building must remain in full operation during the construction period. This contractor shall provide temporary space conditioning, hot water heating, and/or domestic water production for the duration of time which the existing systems are inoperable or have owner approval for any downtime.

B. This contractor shall provide a minimum of 48 hours' notice of any shutdowns and coordinate maximum allowable system downtimes with the Owner and/or Director of Operations prior to the start of work.

C. This contractor shall be responsible for providing temporary heating equipment at any point during construction as required to maintain laborer comfort and avoid damage to the building or any of its associated components, systems, or equipment.

D. Contractor shall provide all temporary or permanent equipment, materials, and labor to ensure these stipulations are met.

E. Temporary heating requirements shall be coordinated with the electrical and plumbing contractor as required. This contractor shall carry all costs associated with utilizing other

contractors to provide materials or labor for temporary services indicated above.

1.29 REBATES

A. The contractor shall make the owner aware of all applicable “upstream” energy rebates available for this project.

B. The contractor shall provide the owner all necessary information and documentation for completion and submission of energy rebate applications.

PART 2: PRODUCTS

2.1 IDENTIFICATION, MARKING AND TAGGING

A. Systems and equipment to be identified and marked and valves tagged include, but are not limited to the Heating, Air Conditioning & Ventilating systems.

B. Submit samples of marking and tagging devices and wording, lettering and numbering scheme for each system.

C. Equipment Identification:

1. Manufacturer's nameplates or trademark shall be permanently affixed to all equipment and materials furnished under this division. Manufacturer's nameplates shall include all pertinent data relative to the piece of equipment including model number, serial number, and operating characteristics as applicable.

2. Separate Equipment Identification Markers shall identify each item of equipment with a permanently attached marker indicating designation and/or number corresponding to design documents.

3. Markers shall be of rigid black Bakelite or phenolic construction with white engraved or incised letters.

4. Lettering on equipment markers shall be of adequate size to be legible from floor levels. In all cases marker lettering shall no be less than 1 inch high.

D. Piping System Identification:

1. Piping Systems shall be identified as indicated herein or as required by applicable codes and/or officials having jurisdiction.

2. Pipe Markers shall be color coded according to " Designations to Colors" - ASME A13.1-2007.

3. All piping and equipment shall be identified by pipe markings, which shall be provided by this Contractor. Markers shall be applied every 20 ft. Markings shall indicate pipe content, system, operating pressure & temperature, and direction of flow. The markers shall be as manufactured by Seton Name Plate Corp. or equal

4. Pipe Markers shall be of the pressure sensitive type as manufactured by the Seton Nameplate Corp. (F10-Code)

5. Valve Identification: Provide laminated plastic nameplates on all valves installed under Division 23, except stop valves in supplies to fixtures. Tags shall be constructed of 0.125 inches thick melamine plastic conforming to Fed. Spec. L-P-387. Surface shall be matte finish. Accurately align lettering and engrave into white core. Nameplates shall be to 2 inches round or hexagonal. Lettering shall be minimum of 0.375 inch high normal block lettering. Key the nameplates to a chart and schedule for each system. Frame one chart and schedule for each system under glass and place where directed in mechanical room. Furnish four copies of each chart and schedule. Each inscription shall identify its function. Attach nameplates with "S" hooks and chain to each valve. Valve nameplates shall be numbered and "keyed".

2.2 SLEEVES, INSERTS AND ESCUTCHEONS

A. Provide sleeves for all work passing through floor, wall, and ceiling construction. Locate and provide sleeves and inserts before the floor, wall or ceiling is constructed. If this contractor does not comply with the above, he shall bear all costs incurred for cutting and patching required for the installation of sleeves and inserts. Holes required for sleeves in existing walls and floors, or to conform to the above shall be saw cut or core drilled. This Contractor shall provide all drilling required for the installation of hangers.

B. Pipe sleeves through outside walls shall be Schedule 80 black steel pipe with 150 lb. black steel slip-on welded flanges welded at the center of the outside. Extend sleeves 1/2 inch beyond each side of the wall. Pack the space between sleeve and pipe with oakum to within 2 inches of each face of the wall. Pack the remaining space and make watertight with an approved waterproof compound.

C. Pipe sleeves through concrete floors or interior masonry walls shall be Schedule 40 black steel pipe, set flush with finished wall or ceiling surfaces, but extending 2 inches above finished floors. Plastic, PVC, or light metal sleeves shall not be installed.

D. Provide individual or strip type inserts pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4-inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods to 1/2 inch diameter to be passed through the insert body. Strip inserts shall have attached rods with hooded ends to allow fastening to reinforcing rods.

E. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe and the insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations.

F. Provide 22 gauge galvanized steel duct sleeves through interior walls, floors and ceilings set flush with finished surfaces.

G. Pack the space between sleeves and structure, and sleeves and pipes or ducts passing through fire rated interior walls, floors, and ceilings with an approved fire and smoke proof packing material. Fire-stopping material shall maintain its dimensions and integrity while preventing the passage of flame, smoke, and gases under conditions of installation and user when exposed to the ASTM E119 time-temperature curve for a time period equivalent to the rating of the assembly penetrated. Cotton waste shall not ignite when placed in contact with the non-fire side during the test. Fire-stopping material shall be non-combustible as defined by ASTM E136; and in addition, for insulation materials, melt point shall be a minimum of 1700 degrees F. for 1-hour protection and 1850 degrees F. for 2-hour protection.

H. Fasten sleeves securely in floors, walls, etc. so that they will not become displaced when concrete is poured or when construction is built around them. Take precautions to prevent concrete, plaster, or other materials being forced into the space between pipe and sleeve during construction.

I. In all areas where ducts are exposed and pass through floors, the hole shall be surrounded by a 4-inch high by 3-inch wide concrete curb, or otherwise protected as determined by the Engineer.

J. Escutcheon plates shall be provided for all exposed un-insulated pipes passing through walls, floors, and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the pipe. Where plates are provided for pipes passing through sleeves, which extend above the floor surface, provide deep recessed plates to conceal pipe sleeves.

2.3 SUPPORTS & ATTACHMENTS

A. Provide all necessary supports and bases required for all equipment, piping and for all other equipment furnished under this contract. Submit shop drawings to the Architect for approval

before purchase, fabrication or construction of same.

B. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are not strong enough shall be replaced as directed.

C. Vibration Isolation: All mechanical equipment, piping and ductwork shall be mounted on vibration isolators/inertia bases to prevent the transmission of vibration and mechanically transmitted sound to the building structure.

1. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.
2. All isolators and isolation materials shall be of the same manufacturer and shall be certified by the manufacturer.

2.4 ELECTRIC MOTORS STARTERS

A. Electric motors and starters shall conform to requirements of the AIEE, NEMA, UL, and NEC and shall be suitable for load duty, voltage, phase, frequency, service and location required. Provide inverter duty rated motors for use with variable frequency drives. Provide shaft grounding rings for all VFD controlled motors.

B. All motors shall be rated at 85% power factor at full rated load. Motors less than 85% power factor shall be corrected to 90% power factor at the factory. All motors shall be rated high efficiency.

C. Starters shall be Cerus International or equal.

1. Enclosed Non-Combination Starter
    a) Motor Starter shall be enclosed in a Type 1 or Type 4 UL rated enclosure.
    b) Motor Starter shall be rated for NEMA class B motors for AC-3 switching and AC-4 switching.
    c) Controls and annunciation shall include Hand- OFF- Auto keypad. LED indication shall include Hand, Off, Auto, Run and Overload. Overload reset shall be available.
    d) Control inputs shall include: Auto Wet input, Auto Dry input, Permissive Auto input, Damper Status Input and Override Input. Automatic control inputs shall be capable of accepting a transistorized input without the need for interposing relays. Wet control inputs shall accept AC or DC inputs from 10 to 138VACor DC.
    e) Damper control shall be built into the starter to provide 24VAC or 120VAC damper control and monitoring.
    f) Override input shall disable the starter from operating in either Hand or Auto mode.
    g) Protective Functions
        (i) Electronic Overload shall provide phase failure and phase loss protection, stall, and class 1 - 30 selectable overload protection. Phase failure protection shall initiate when phase loss is greater than 70% for 3 seconds or phase unbalance is greater than 50% for more than 5 seconds.
        (ii) Cycling fault protection shall be integral to the starter. Cycling fault shall be enabled whenever the starter is cycled more than 1000 times in a one hour period. This feature shall be selectable to be disabled. Cycling fault shall cause overload LED to blink rapidly.

2. Enclosed Combination Starter

a) Enclosed combination starter shall include all of the above descriptions in addition to either a motor circuit protector with lock-out mechanism, a UL 508 breaker, or a fused disconnect with lock-out mechanism.

b) The Motor Circuit protector shall be a UL listed 508 manual motor starter with magnetic trip elements only. The breaker and shall carry a UL 508F rating (up to 100A frame size) which provides for coordinated short circuit rating for use with the motor contactor and provides an interrupting rating for the breaker and contactor combination.

c) Fused disconnect shall be UL 98 suitable for service entrance protection.

d) UL 508 breaker shall include thermal and magnetic trip mechanisms.

2.5 USE OF INSTALLATION

A. The Owners shall have the privilege of using any part of the installation when sufficiently complete, but such use thereof, or partial or final payment shall not be considered as an acceptance of such work in lieu of a written certificate from the Engineer.

2.6 DUCTWORK

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, supports and sealing for operating pressures indicated.

B. Duct gauge shall be as required by SMACNA Duct Construction Standards taking into account duct size, supports, pressure rating, and any other relevant parameters. All ductwork, regardless of SMACNA Standards, shall be no thinner than 26 gauge.

C. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90.

1. Sealant: As recommended by manufacturer specifically for sealing joints and seams in ductwork.

2. Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

3. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

D. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

E. Flexible Ductwork: Duct shall be Flexmaster Type 4 Insulated Duct as manufactured by Buckley Associates or approved equal.

1. Flexible duct (insulated) shall be Underwriters Laboratory Listed (UL 181 Class I Connector) and constructed in accordance with NFPA Standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.

2. Duct fabric shall be of a smooth airtight polymer film mechanically locked to the outside helix. (Use of adhesives to lock to fabric in place is unacceptable.) The helix is constructed of corrosive resistant galvanized steel, formed and mechanically locked to the duct fabric on the outside to prevent tearing of the flexible duct.

3. Insulated flex shall have a fire retardant polyethylene outer jacket with a 1/2 lb. density, 1-1/2” thick fiberglass insulation blanket, factory wrapped.

4. The flexible duct shall be supported as required to prevent sagging. Flexible duct with excessive sagging will not be approved.

5. Flexible ductwork shall be rated at 6” positive pressure and 10” negative

pressure for sizes up to 12”. Negative pressure for 14” to 16” shall be 5”. Negative pressure for 18” shall be 1”.

6. Length of installed flexible duct shall not exceed 6’-0” in developed length.

F. Flexible Connections

1. Flexible connections shall be provided where a fan connects to a duct or casings to prevent transmission of vibration to ductwork.
2. Flexible connections shall fit tightly around ducts and fans and be securely bolted or clamped in place. Taping shall not be allowed.
3. Flexible duct connections shall be 6” long and made of straight, waterproof, flame retardant fabric having a flame spread rating of not over 25 and a smoke development rating of not over 50

G. Existing Ductwork: Any existing ductwork within the area of work or connected to systems within the area of work shall be professionally cleaned by a experienced certified duct cleaning company. Contractor shall submit before/after photographs of each duct system cleaned.

H. Volume Dampers:

1. Provide Young Regulator manual adjustable rectangular opposed blade dampers for duct heights less than 12” with factory-installed locking hand quadrants extended 2” for all dampers installed in externally insulated duct:
    a) On each supply, return and general duct take-off.
    b) At each take-off to register, grille or diffuser (not all are shown on drawing).
2. Dampers are manufactured approximately 5/16” smaller in width and 1/8” smaller in height than size of duct in which they are installed; e.g., nominal damper size is 24” x 10”; actual size is approximately 23-11/16” x 9-7/8”.
3. Damper frame shall be constructed of #6063 extruded aluminum reinforced channel with minimum thickness of .050”. Opposed damper blades shall be #6063 extruded aluminum with minimum thickness of .050” and shall include reinforcing ribs. Each blade shall be supported in the damper frame by individual Teflon axle bearings, and shall be driven by stainless steel connecting slide linkage controlled by 3/8” square steel control shaft.
4. Note: All required volume dampers may not be indicated on drawings but dampers shall be provided as necessary for systems balancing.
5. Dampers 12” and larger in height shall be opposed multi-blade equal to Greenheck, Nailor or Vent Products.
6. Where dampers are inaccessible, use Young Rectangular locking type ceiling regulators and miter gear or worm gear for all horizontal dampers. Bearing coupling for bottom duct control may be used for shaft on vertical blade dampers. The 3/8” rod between ceiling regulator and damper shall be provided by Contractor.
7. Where dampers are to be located above hard ceilings Young Regulator Bowden Cable Control Dampers shall be utilized. Controllers (actuators) shall be of the concealed ceiling type. Controller type, finish & locations to be approved by architect prior to purchase & installation. The cable between the damper and controller shall be provided by the contractor.
8. Damper blades shall be two gauges heavier than adjoining ductwork, and shall be riveted to supporting rods. Hem over edges parallel to rods.

9. Brackets shall be galvanized metal, secured to ductwork with sheetmetal screw with locking quadrant arms (see seal class section for additional requirements). Provide 2" handle extension for all dampers on externally insulated ductwork.
10. Note: All required volume dampers may not be indicated on Drawings but dampers shall be provided as necessary for system balancing.

2.7 DUCT INSULATION

A. Compliance: Insulation thickness, conductivity and installation shall comply with local Mechanical and Energy Codes. Where local code conflicts with specifications, the more stringent shall apply.

B. Definitions:

1. Conditioned Space: An area, room or space that is enclosed within the building thermal envelope and is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls, floors, or ceilings or where they contain uninsulated ducts, piping or other sources of heating or cooling,
2. Unconditioned Space: An enclosed space within a building that is not a conditioned space or a semiheated space. Crawlspaces, attics, and parking garages with natural or mechanical ventilation are not considered enclosed spaces.

C. Supply and Return Air Duct Insulation:

1. Insulation: ASTM C553; flexible, foil faced, noncombustible blanket.
   a) Exposed Conditioned
      (i) Supply Air: No Insulation Required
      (ii) Return Air: No Insulation Required
      (iii) Outside Air: No Insulation Required
   b) Concealed Conditioned
      (i) Supply Air: R-Value of 6.0 installed.
      (ii) Return Air: No Insulation Required
      (iii) Outside Air: R-Value of 6.0 installed.
   c) Unconditioned
      (i) Supply Air: R-Value of 8.0 installed.
      (ii) Return Air: R-Value of 8.0 installed.
      (iii) Outside Air: No Insulation Required
   d) Examples
      (i) Supply and return ducts in conditioned space: No Insulation Required by energy code. However insulation shall be provided for concealed cooling supply ducts to prevent condensation. **R-**Value of 6.0 installed.
      (ii) Supply and return ducts in vented attic: R-Value of 8.0 installed.
      (iii) Supply and return ducts in exposed shaft: R-Value of 8.0 installed.
      (iv) Supply and return ducts in unvented attic: R-Value of 8.0 installed.
      (v) Return ducts in indirectly conditioned ceiling spaces: No Insulation Required.
      (vi) Supply and return ducts in vented crawl space: R-Value of 8.0

installed.

(vii) Supply and return ducts below grade: R-Value of 8.0 installed.

2. Vapor Barrier Jacket:
    a) Kraft paper with glass fiber yarn and bonded to aluminized film.
        (i) Moisture vapor transmission: ASTM E96; 0.02 perms.
        (ii) Secure with pressure sensitive tape.
3. Vapor Barrier Tape:
    a) Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Exhaust Ductwork Insulation:
1. Insulation: ASTM C553; flexible, foil faced, noncombustible blanket.
2. Direct Exhaust: No Insulation Required.

2.8 INTERIOR DUCT LINER

A. Polymer Foam insulation (EPFI) equal to IMCOA “IMCOSHEET” Engineered Polymer Foam Insulation, 1 inch thick, R = 4.0, closed cell. Insulation shall be installed as required by the insulation manufacturer. Insulation shall be in compliance with NFPA 90 and 90B. Flame spread shall be less than 25 and smoke density less than 50 per ASTM E-84, NFPA 255, UL 723 Class I and UL 181.

B. Duct lining shall be applied in the following locations:
1. 10’ upstream and downstream from all air handling unit of 10 tons or less.
2. 5’ downstream from all other fan powered units including, but not limited to, fan powered UV boxes.

C. Areas provided with interior duct lining shall also be provided with exterior duct insulation as indicated by these specifications.

2.9 PIPING

A. Hydronic Piping
1. Steel Pipe: ASTM A53, Schedule 40, black.
    a) Fittings: ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings or Victaulic ductile iron ASTM A536/395.
    b) Joints: Threaded, or AWS D1.1,welded or Victaulic grooved joints.
2. Copper Tubing: ASTM B88, Type L, hard drawn.
    a) Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
    b) Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
    c) Joints: Solder, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F or Victaulic grooved joints.

B. Equipment Drains and Overflows
1. Copper Tubing: ASTM B88, Type L, hard drawn.
    a) Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
    b) Joints: Solder, lead free, 95-5 tin-antimony, or tin and silver, with melting

range 430 to 535 degrees F (220 to 280 degrees C) or Victaulic grooved joints.

2. PVC Pipe: ASTM D1785, Schedule 40 and Schedule 80 for sizes 8 inch (200 mm) and larger or ASTM D2241, SDR 21 or 26.
    a) Fittings: ASTM D2466 or D2467, PVC.
    b) Joints: ASTM D2855, solvent weld.

C. Unions, Flanges and Couplings

1. Unions for Pipe 2 Inches (50 mm) and Under:
    a) Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.
    b) Copper Pipe: Bronze, soldered joints.
2. Couplings for Victaulic Grooved Joint Systems for Copper Piping Systems 2 inches and Larger:
    a) Rigid: Style 607 with Grade EHP EPDM gasket rated for –30F to 250F.
3. Provide di-electric fittings waterways wherever copper pipe meets steel pipe or other dissimilar metals.

2.10 VALVES

A. Valve Features

1. General Comply with ASME B31.9 for building services piping, and ASME
2. Valve Design; Valves shall have rising stem, or rising outside screw and yoke stems; except, non-rising stem valves may be used where headroom prevents full extension of rising stems.
3. Pressure and Temperature Ratings As scheduled and required to suit system pressures and temperatures.
4. Sizes unless otherwise indicated, provide valves of same size as upstream pipe size.
5. Operators Provide the following special operator features:
    a) Hand wheels fastened to valve stem, for valves other than quarter turn, by brass nut on a square-topped stem.
    b) Lever handles on quarter-turn valves 6 inch and smaller, except for plug valves. Provide one wrench for every 10-plug valves, and a one years supply of recommended lubricant or sealant.
    c) Chain-wheel operators for valves 2-1/2 inch and larger installed 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.
    d) Gear drive operators on quarter-turn valves 8 inches and larger.
6. Extended Stems where insulation is indicated or specified, provide extended stems arranged to receive insulation.
7. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
8. End Connections: As specified in the individual valves specifications.
9. Threads Comply with ANSI B2.1.
10. Flanges Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.

11. Solder-Joints Comply with ANSI B16.18.
12. Caution: Where soldered end connections are used, use solders having a melting point below 840 degrees. F for gate, globe, and check valves; below 421 degrees. F for ball valves.
13. Groove-Ended Valves Comply with AWWA C606

B. Gate Valves

1. Gate Valves - 2 Inch and Smaller MSS SP-80; Class 150, body and bonnet of ASTM B 62 cast bronze, threaded or solder ends, solid disc, gland packed, N.A. packing.

C. Ball Valves

1. Ball Valves – 1 Inch and Smaller Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; 2-piece construction, bronze body conforming to ASTM B 62, standard (or regular) port, stainless steel ball, replaceable “Teflon” or “TFE” seats and seals, blowout proof stem, and vinyl-covered steel handle. Threaded ends for heating hot water and low-pressure steam.
2. Ball Valves - 1-1/4 Inch to 2 Inch Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; 3-piece construction, bronze body conforming to ASTM B 62, conventional port, stainless steel ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Threaded ends for heating hot water and low-pressure steam.
3. Ball Valves-1/2 inch through 2inch Rated for up to 600 psi WOG, brass body, standard port, threaded ends, 2-piece, chrome-plated brass ball, TFE seats. Victaulic Style 722.
4. Ball Valves-1-1/2 inch through 6 inch. Rated for up to 1000 psi. ductile iron body, standard port, grooved ends, 2-piece, chrome-plated carbon steel ball, TFE seats. Victaulic Style 726.

D. Plug Valves

1. Plug Valves - 2 Inch and Smaller 150 psi WOG, bronze body, straightaway pattern, square head, threaded ends.

E. Globe Valves

1. Globe Valves - 2 Inch and Smaller MSS SP-80; Class 150, body and union bonnet of ASTM B 62 bronze, gland packed, N.A. packing. Bronze trim, composition disc.

F. Butterfly Valves

1. Butterfly Valves - 2 Inch and smaller MSS SP-67; 200 psi, cast bronze body, Viton seals, full port design, stainless steel trim, threaded or solder ends.

G. Check Valves

1. Swing Check Valves - 2 Inch and Smaller MSS SP-80; Class 150 or 200, cast bronze body and cap conforming to ASTM B 62, horizontal swing, with a Teflon disc, and having threaded ends. Valve shall be capable of being repaired while the valve remains in the line.
2. Wafer Check Valves - (Non-Slam) Class 250, cast iron body, replaceable lapped bronze seat, lapped and balanced twin bronze flappers and stainless steel trim. Valve shall be designed to open and close at approximately one-foot differential pressure. Twin flappers shall be loaded with a stainless steel torsion spring to minimize flapper drag and assure even non-slam checking action.

H. Combination Balancing & Shutoff Valves:

1. 2” and Smaller Sizes: 300 psi, threaded or sweat ends, non-ferrous Ametal® brass copper alloy body, EPDM o-ring seals. 4 turn digital readout handwheel for balancing, hidden memory feature with locking tamper-proof setting. Victaulic / TA Hydronics Series 786/787 or Engineer Approved Equal .
2. Koil-Kit™ Components: Install Series 78U union port fitting and Series 78Ystrainer/ball valve combination to complete terminal hook-up at coil outlet

I. Balancing Valves

1. Balancing valves shall be provided on all piping mains and takeoffs as required to balance the system to the flows indicated on the drawings and in the equipment schedules.
2. Balancing valves shall be sized such that the specified flow through the valve generates an input to the flow measurement device that is within the range of accuracy of the device. Oversized valves that generate inputs that are below the range of the device and undersized valves that result in excessive pressure loss are not acceptable. Balancing valve submittals shall indicate size, flow and valve characteristics.

J. Vent Piping

1. Zinc-coated steel conforming to ASTM A120 standard weight, with zinc-coated malleable iron fittings conforming to Fed. Spec. WW-P- 521.

K. Valves

1. Shall be installed with their stems horizontal or above. Valves shall have threaded end connections with a union on one side of the valves.
2. Ball type bronze body, 4 bolt type, Teflon seats and seals 150 psi
3. Check Valves shall be: Mil Spec. MIL-V-18436, Type III Class 150, non-slamming type. Swing check, oil resistant disk

2.11 PIPING ACCESSORIES

A. Dielectric Unions: Unions comprising steel female pipe thread end and copper solder-joint end conforming to dimensional, strength and pressure requirements of Fed. Spec. WW-U-531, Class 1. Steel parts shall be galvanized or plated. Union shall have water-impervious insulation barrier capable of limiting galvanic current to 1% of the short-circuit current in a corresponding bimetallic joint. When dry, it shall also be able to withstand a 600-volt breakdown test.

1. Dielectric Waterways: Electroplated steel or ductile-iron nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig maximum working pressure at 230 deg F. Victaulic Style 47.
2. Joints between different piping materials shall be made with a mechanical joint or dielectric fitting.

B. Strainers: Single basket type, with inlet and outlet on the same center line. Cast steel or fabricated steel body, mesh 300-series stainless- steel baskets. Open area of one basket shall be 2-1/2 times inlet or outlet piping area. Furnish on spare basket.

1. Strainers for Grooved Piping Systems:
    a) Y-Pattern Strainers: Ductile iron body ASTM A536 with coupling/cap and blowdown port bottom drain connection. Grooved ends 2”-18”. 304 SS perforated removable basket with .062” or .156” holes (depending on size) and start-up screen. 300 CWP. Victaulic Style 732/W732.
    b) T-Pattern Strainers: Ductile iron body ASTM A536 with coupling/cap or ASTM A53 carbon steel with T-bolt hinged closure/cap. Grooved ends 2”-24”. 304 SS

perforated removable basket with .042”-.126” holes (depending on size) and start-up screen. 300 CWP. Victaulic Style 730/W730.

C. Sleeves: Provide where piping passes through masonry or concrete walls, floors, roofs and partitions. Sleeves shall be placed during construction. Sleeves in outside walls below and above grade, in floor, or in roof slabs, shall be standard weight zinc coated steel pipe. Sleeves in partitions shall be zinc coated sheet steel having a nominal weight of not less than 0.90 pound per square foot. Space between piping and the sleeve shall be not less than 0.25 inch. Sleeves shall be of sufficient length to pass through entire thickness of walls, partitions or slabs.

2.12 PIPING INSTALLATION

A. Piping shall be inspected, tested and approved before being buried, covered or concealed. Horizontal piping shall be pitched with a minimum grade of one inch in 50 feet. Fittings shall be provided for changes in direction of piping, and for all connections. Fuel supply piping shall allow for ample tank movement and pipe expansion.

B. Install piping free from traps and drain toward tank.

C. Pipe Sleeves: Firmly pack space between the pipe or tubing, and sleeve with oakum and caulk on both ends of sleeve with elastic cement.

D. Unions, Flanges and Victaulic Couplings: Place unions, flanges or Victaulic couplings where necessary to permit easy disconnection of piping and apparatus. Each connection having a screw end valve shall have a union.

E. Valves: Install valves in positions accessible for operation and repair. Install check valve and an isolation valve on suction line of each fuel oil storage tank.

F. Field Testing: Upon completion and before final acceptance of the work, each system shall be tested as in service to demonstrate conformance with the contract requirements and in accordance with the requirements of ANSI B31.3 and NFPA 30.

G. Each new piping system will be hydrostatically tested at not less than 1.5 times the working pressure in accordance with ANSI B16.3, but in no case less than 200 psig and shall show no leakage or dials indicating not less than 1.5 times nor more than 2 times the test being placed in operation. Remove fuel quality monitor elements and water separator elements from filter separators before hydrostatic tests. Do not subject tank to pipe test pressures. Refer to tank manufacturers data for maximum test conditions.

H. Contractor shall provide one full tank load of fuel oil of the proper grade after successful testing.

I. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid or flexible, where required, grooved-end-pipe couplings. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. A Victaulic factory trained field representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

J. Piping which contains any fluid which could potentially freeze is strictly prohibited from being installed within areas which may be subject to freezing temperatures. If, during the installation process, it is noted that such piping will be located in an area subject to freezing temperatures it must be brought immediately to the attention of the engineer. If such an installation is unavoidable affected piping shall be provided with additional insulation as required by the energy code as well as heat tracing and associated power circuiting as required to avoid the fluid freezing.

2.13 PIPING INSULATION

A. Insulation

1. Hydronic/Steam Piping: Preformed glass fiber meeting ASTM C547, "k" value of 0.24 @ 75°F with all service jacket (ASJ). Service temperature 0°F to +850°F, 25/50.
2. Low Temperature Fluid Applications: Provide insulation with integral wick material. Product shall include a factory applied integral vapor retarder extending under the evaporator area of the wick and covering not less than 98% of the circumference of the product. Exposed evaporator area shall be not less than 0.1 sq. ft./linear ft. of product.
3. Plenum Return Applications: All insulation, jackets and accessories shall be rated for use in return air plenums.

B. Compliance: Insulation thickness, conductivity and installation shall comply with local Mechanical and Energy Codes.

C. Minimum Pipe Insulation:

1. Hot Water: 1-1/2” Thick, ≤ 1-1/2” Nominal Pipe Diameter
2. Hot Water: 2” Thick, > 1-1/2” Nominal Pipe Diameter
3. Chilled Water/Cold Condensate/Refrigerant: 1-1/2” Thick, ≤ 1-1/2” Nominal Pipe Diameter
4. Chilled Water/Cold Condensate/Refrigerant: 1-1/2” Thick, > 1-1/2” Nominal Pipe Diameter

FLUID	**NOMINAL PIPE DIAMETER**	
	≤1.5”	>1.5”
Hot Water	1 1/2"	2”
Chilled Water, Cold Condensate, or Refrigerant	1 1/2"	1 1/2"

D. Condensate Piping

1. All condensate piping, regardless of temperature, shall be provided with insulation.
2. Condensate generated by cooling coils shall be considered Low Temperature Fluid.

E. Fittings: Factory precut insulation inserts, thickness to be same as adjacent. Enclose in premolded, PVC fitting covers.

1. Low Temperature Applications: Fittings and valves shall be wrapped continuously with wicking material prior to installing insulation to ensure a continuous path for removal of condensation.

F. Jackets:

1. Interior: Factory applied, all service jacket of white Kraft bonded to aluminum foil reinforced with fiberglass yarn and suitable for painting. Longitudinal and butt joints shall be made with factory applied pressure sensitive material.
2. Exterior/Exposed (Low Temperature): Field applied, 20 mil, PVC sheet material.
3. Exterior/Exposed (High Temperature): Field applied, Aluminum sheet material.

4. All jackets exposed to the weather shall be reflective, UV resistant and sealed watertight.

G. Preparation

1. Install materials after piping has been tested and approved.

H. Installation

1. Install materials in strict accordance with manufacturer's instructions.
2. Continue all insulation through penetrations.
3. In piping exposed to view, locate insulation and cover seams in least visible locations.
4. On piping that requires condensation control, (i.e. chilled or cold) insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
5. On piping not requiring condensation control (i.e. steam, condensate hot water) do not insulate flanges and unions at equipment, but bevel and seal ends of insulation at such locations.
6. Provide pipe insulation with weatherproof jacket on exterior piping that has heat trace.

I. Supports:

1. All piping shall be supported in such a manner that the insulation is not compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that the circumferential joint may be made outside the hanger. Cover the evaporating holes with contractor supplied VaporWick Sealing Tape for the length of the metal saddle.
2. Piping systems 3" (75 mm) in diameter or less, insulated with fiberglass pipe insulation, may be supported by placing saddles of the proper length and spacing under the insulation as designated in Owens Corning Pub. 1-IN-14210.
3. For hot or cold piping systems larger than 3" (75 mm) in diameter, operating at temperatures less than +200F (93C) and insulated with fiberglass, inserts such as foam or high-density fiberglass with sufficient compressive strength shall be used to support the weight of the piping system.
4. On vertical runs, insulation support rings shall be used.

J. Accessories:

1. Insulation Bands: ¾ inch wide; 0.015 stainless steel
2. Metal Jacket Bands: ½ inch wide; 0.015 thick aluminum.
3. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.
4. Finishing Cement: ASTM C449.
5. Fibrous Glass Cloth: Untreated; 8oz/sq. yd. Weight.
6. Adhesives: Compatible with insulation.
7. Wick material for wrapping valves and fittings
8. Closure Materials –Sealing Tape, and mastics.
9. Support Materials - Hanger straps, hanger rods, saddles, support high-density blocks, and support rings.
10. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions, and/or in conformance with the current edition of "Commercial & Industrial Insulation Standards."

2.14 WATER TREATMENT

A. All hydronic HVAC systems shall be provided with water treatment chemicals during initial fill of the systems. Chemicals shall be designated for use in the specific system type and be provided in concentrations as recommended by the chemical manufacturer.

B. Where indicated on the drawings provide Propylene Glycol to hydronic systems in the concentrations indicated. Glycol shall be of the inhibited type and be provided with additional water treatment chemicals to prevent corrosion.

C. Hydronic systems shall be provided with a chemical shot feeder for the maintenance of water treatment chemicals.

D. Where Glycol Make-up systems are provided the contractor shall fill the tank with glycol solution at the completion of the project.

E. Contractor shall provide submittals for review and approval for all water treatment chemicals.

2.15 PIPING / EQUIPMENT LOCATED IN AREAS SUBJECT TO FREEZING

A. All piping subject to freezing shall be wrapped with heat trace cable, insulated as per specification and energy code, and in the case of drain piping, maintain a minimum continuous slope of 1%.

B. Where ceiling mounted equipment penetrates into an uninsulated attic space, it shall be covered with blanket insulation meeting minimum building code requirements and done in a manner complying with the equipment manufacturer’s recommendations.

2.16 FIRESTOPPING

A. Provide Firestopping systems for penetrations in fire-resistance-rated assemblies, including both membrane and through penetrations. This contractor shall thoroughly review architectural plans for assembly type and location and shall prepare bid accordingly.

B. Materials and systems shall be designed to meet the requirements of the intended application and shall be installed per manufacturer’s guidelines.

C. Submittals: Provide for review Manufacturer’s product literature and tested assembly for each type of fire protection material including product characteristics, typical uses, installation procedures, performance and limitation criteria.

2.17 DRIP PANS & LEAK DETECTION

A. Drip pans shall be provided where indicated on plans and under all new and existing piping within critical spaces.

B. Drip pans shall be constructed of continuously welded sheet metal. Each section shall be provided with a wire type leak detection sensor compatible with fluids present in piping. Leak detection alarms shall be tied back to Building Management System.

C. Provide new leak detection sensors in all existing drip pans. Tie alarms back to Building Management System.

2.18 SECONDARY DRAIN PANS

A. A secondary drain pan shall be provided under each piece of concealed (above ceilings, in closets, etc.) HVAC equipped which produces condensate.

B. The pan shall have a minimum depth of 1.5” and shall not be less than 3” larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion resistant material. Metallic pans shall have a minimum thickness of not less than 0.0276-inch galvanized sheet metal and non-metallic pans shall have a minimum thickness of not less than 0.0625 inch.

C. The secondary drain pan with a separate drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the drain pan at a higher level than the primary drain connection.

D. A secondary drain pan without a separate drain shall be equipped with water level detection device that will shut off the equipment served prior to overflow of the pan

PART 3: EXECUTION

3.1 OPERATING INSTRUCTIONS

A. Instruction to the Owner's Personnel - After completion of all work and all tests and at such times as designated by the Architect, provide the necessary skilled personnel to operate the entire installation until receipt of owners acceptance.

B. During the operating period, instruct the Owner's representative in the complete operation, adjustment, and maintenance of the entire installation.

C. Give at least forty-eight (48) hours advance notice to the Owner to coordinate scheduling of this instructional period.

D. Furnish to the Architect five (5) complete bound sets of typewritten or blueprinted instruction manuals for operating and maintaining all systems and equipment included in the contract. All instruction manuals shall be submitted in draft, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.

E. The above-mentioned instructions shall include the maintenance schedule for the principal items of equipment furnished under this contract.

3.2 MANUFACTURER'S RECOMMENDATIONS:

A. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

3.3 TESTING, ADJUSTING, STARTING UP AND COMMISSIONING

A. Testing: All work must be proved satisfactory. The tests herein specified shall be applied in the presence of, and to the satisfaction of, the Architect before the work is covered, concealed or made inaccessible to testing, repair, correction or replacement. Accommodate the testing operation to the progress of the project as a whole. Correct all defects appearing under test and repeat the tests until all parts of the work have been successfully tested. Apply the specific tests herein described. Present all work for acceptance in clean condition, properly adjusted and in good working order; for instance, all machinery must be quiet, well balanced, and must be in place and reading accurately. All systems, equipment, controls, and devices in this work shall be tested in operation and must prove for their purposes in the judgment of the Architect or his authorized representative. All internal surfaces of all lines and equipment shall be blown or flushed clean. Where pressure tests are specified, the apparatus shall be clean before the tests are applied. Contractor shall provide adequate protection of piping and duct systems to prevent vandalism and/or accidental damage, blockage, etc., that will hinder or prevent proper operation of the finished systems.

1. Provide instruments, pumps, gauges, supplies, equipment, materials, and labor for testing and starting up. Dispose of test water and wastes after test, in a manner approved by all applicable codes.

2. Perform tests which may be required by authorities or agencies in addition to those

herein specified.

3. Piping for hot water, chilled water, supply and return, drain, escape and relief valve discharge shall be tested with water and made tight under pressure of 150 pounds per square inch gauge maintained for one hour without pumping or as long as required to inspect all joints. Repair all leaks and retest. Piping shall be made tight without caulking. Apply pressure tests to piping only before connection of equipment. In no case shall piping, equipment or accessories be subjected to a pressure exceeding it's rating. Low-pressure elements shall be isolated or removed before tests are conducted.
4. Test valve bonnets for tightness. Test operate all valves at least once from closed-to-open-to-closed positions while valve is under pressure. Test all automatic valves for proper operation at the settings indicated. Test pressure relief valves at least three (3) times.
5. Test piping specialties for proper operation. Test air vent points to ensure that air has been vented.
6. Furnish certified shop test records for all pressure vessels. After installation, test at full operating pressures and temperatures maintained for one hour. Set and test all pressure control, relief and safety devices.
7. Repair or replace all defective work and repeat tests until the particular system and component parts thereof receive the approval of the Architect.
8. The duration of tests shall be as determined by authorities having jurisdiction, but in no case less than the time prescribed in each section of the specifications.
9. Test equipment and systems, which normally operate during seasons of the year during the appropriate season. Perform tests on individual equipment, systems and their controls. Whenever the equipment or system under test is interrelated with and depends upon the operation of other equipment, systems and controls for proper operation, function, and performance; the latter shall be operated simultaneously with the equipment of system being tested.

B. Adjusting, Balancing and Starting Up

1. Flush clean all systems prior to starting up the system. Any damages to the building or system components caused by failure to clean the systems properly shall be corrected to the satisfaction of the Architect or his authorized representative at no additional cost to the Owner.
2. In duct and piping systems, eliminate all noise and vibration and take all measures to secure proper circulation.
3. Run motor-driven equipment continuously for at least two hours in the presence of the Architect. Correct all defects of noise, vibration, alignment and balance. Replace all motors, which overheat or are noisy.
4. Balance systems completely for temperature, volume, and pressure per NEBB performance standards. Balancing subcontractor shall provide proof of certification by NEBB.
5. Air and water volumetric flow rates shall be within ten (10) percent of those specified. Air and water quantities and pressures shall be tested, balanced and recorded at all terminal devices. Volumetric flows and pressures shall be recorded on suitable forms and submitted for approval.
6. Provide any and all labor and equipment necessary to properly balance the installation including but not limited to dampers, valves, flow stations, test ports, sheaves, belts, etc.

7. All sequences of the system shall be checked and all temperature controls operated and commissioned as required to insure that all systems operate per Engineers intent.

C. Commissioning

1. This Contractor shall provide the deliverables to the engineer/owner.
2. Copies of all records shall be provided to the Engineer by this Contractor including, but not limited to:
    a) Equipment manuals including the name of at least one service agency;
    b) Testing and Balancing reports;
    c) Functional performance testing of the equipment, controls, economizers, and lighting control systems.
3. All commissioning shall be performed as indicated here and elsewhere in the specifications and shall comply with provisions of the applicable Energy Conservation Code.

3.4 SEQUENCE OF OPERATIONS

A. Sequence of Operations: This is a performance-based specification intended to convey the control intent of the various systems. The contractor shall provide detailed shop drawings including P&ID diagrams, equipment lists and finalized sequences for review by the Engineer prior to installation. Any questions concerning specific details shall be referred to the engineer for clarification.

B. System: It is the intent of this specification that a complete Building Management System (BMS) utilizing Direct Digital Control (DDC) be provided to control and monitor all HVAC systems within the facility.

C. System: It is the intent of this specification that all new systems and equipment be tied into the existing Building Management System (BMS) utilizing Direct Digital Control (DDC) to control and monitor all new HVAC systems within the facility. Contractor shall field coordinate BMS protocols and provide all required equipment, wiring, hardware, software, and programming to ensure full control of new equipment through the existing BMS.

D. System: It is the intent of this specification that programmable electronic controls be provided to control occupied/unoccupied modes of all HVAC systems within the facility. Systems shall be provided with all additional required controls including, but not limited to, space mounted monitoring and user interface devices, to provide the specified sequence.

E. Equipment and Wiring: This contractor shall provide all control equipment, and wiring (regardless of voltage) to accomplish the sequence of operations as detailed below. This contractor shall carry funds sufficient to hire the Electrical Contractor to provide line-voltage power, including any required wiring, breakers, and/or disconnects, to all control's components needing such power. Such components shall include, but may not be limited to:

1. Control Transformers
2. Central Equipment Controllers
3. BMS Controllers
4. Line-voltage Thermostats or other sensors

F. Control and Monitoring: Sensors shall be provided throughout the HVAC systems (hydronic and air) as required to control and monitor their operation and verify performance at BMS. Provide sensors with remote mounted stats where indicated on the drawings. Where multiple space mounted sensors are required for a given unit they shall be located in the same general area.

G. Safety Controls: This contractor shall provide all safety controls required to protect the building and all controlled equipment from damage as well as those controls necessary to signal abnormal operation or malfunction of equipment. These shall include but not be limited to high limits, low limits, freezestats, flow switches, interlocks and relays.

H. Energy Efficiency: All controls and sequences shall be configured to provide maximum energy efficiency while maintaining occupant comfort.

I. Functional Performance Testing: The contractor shall perform complete and thorough Control Functional Performance Test (FPT) and Commissioning of the control systems. Upon completion of the FPT, a report shall be submitted to the engineer for review and comment. The FPT shall include testing of:

1. Safeties in every mode, i.e., in manual run mode as well as auto mode.
2. Signals to and from the fire alarm, security and entry systems.
3. Sequences of operation step by step in every mode and possible situation.
4. The operation of all control loops under actual operating conditions.
5. The interlocked operation of all equipment (i.e., the operation of starters in manual and off modes as well as auto mode, damper end switch interlock, etc.)
6. Where the BAS performs computations, the actual computation of any formulas and simulation of actual conditions to check the BAS computations.
7. Review of BAS programs for errors and omissions.
8. Commissioning should test every conceivable life safety scenario and every conceivable operational scenario that the system will encounter and document this testing with printed graphs of trend logs.

J. Building Management System

1. System interface shall be web-based and accessible & adjustable from any web browser. System alarms and alerts shall be able to be programmed to be directed to a phone or email address.
2. System shall monitor all associated equipment & points in real-time.
3. System shall be capable of providing multiple occupancy schedules. Schedules shall be able to be programmed on a daily or monthly basis. Schedules shall allow for holidays. All schedules shall be able to be temporarily overridden at the request of the system operator though the web portal or at the space mounted user interface.
4. The following points shall be monitored by the BMS:
    a) Outside Air Temperature (DB/WB)
    b) Outside Air Relative Humidity
    c) Classrooms
    d) Conference Rooms
5. The BMS shall provide alerts for the following:
    a) Alarm/Trouble from any of the monitored systems
    b) Hot water supply temperature out of range
    c) Chilled water supply temperature out of range
    d) Loss of motor function and/or flow (all monitored equipment)
6. System shall communicate using open protocols (e.g. BACnet, Lonworks). Controls contractor shall be responsible for ensuring all equipment is capable of effectively

communicating with the BMS.

7. Refer to sequence of operations for additional information & requirements. All required fan & flow monitoring of belt drive systems shall be directly detected. Motor CTs shall not be accepted on belt drive equipment.
8. As a part of this contract, this contractor shall engage an electrical contractor to provide power and data wiring to all BMS controllers or other BMS system devices requiring the same.

K. Unit Ventilator Controls

1. Unit ventilator shall operate as primary source of cooling and heating within the room.
2. Occupied/Unoccupied Modes
    a) Unit ventilator controller will be commanded to occupied/unoccupied control via an adjustable time schedule residing in a network resident scheduling device. Space sensor provides an unoccupied override push button that allows occupied control for a period of time as set in controller.
3. Morning Warm-up Mode
    a) Morning warm-up mode will pre-start the unit vent in order to heat the space to occupied set point by the beginning of scheduled occupancy time. If space temperature as sensed at space temperature sensor is below occupied set point the damper will be positioned to full return air, hot water valve shall provide full flow to the coil, the face-and-bypass damper shall modulate to full-face, and the supply fan will start. When space temperature reaches occupied set point, warm-up mode will end and the unit vent will operate in normal occupied mode.
4. Occupied Mode
    a) When commanded to occupied mode, the supply fan will start and run continuously. When fan operation has been proven by the current switch, the outdoor air and return air dampers will modulate to introduce minimum outdoor air to the space and occupied control will be enabled. The face-and-bypass damper shall modulate to full bypass.
    b) Winter: If space temperature falls below occupied heating set point (adjustable) as sensed at space temperature sensor, the outdoor air damper will remain at minimum outdoor air position and the hot water valve will open, and the unit shall modulate its face-and-bypass damper to maintain the space temperature set point. As space temperature rises to set point, the hot water valve will modulate closed and the unit shall modulate to full bypass.
    c) Summer: If space temperature rises above occupied cooling set point (adjustable), the hot water valve will remain closed to the coil and the damper will modulate towards the full outdoor air position, as required, allowing outdoor air into the space. The damper function will be limited by the discharge air temperature sensor to prevent discharge air temperature from falling below 60°F (adjustable).
5. Unoccupied Mode
    a) Summer Standby: The supply fan will be off, the damper will be positioned to full return air and the hot water valve will be fully closed to the coil. The face-and-bypass damper shall be set to full face.

b) Winter Standby: The discharge air temperature sensor will modulate the hot water valve, as required, to maintain a minimum "warm box" temperature set point of 55°F (adjustable).

c) Winter: If space temperature falls below reduced night setback temperature heating set point (65°F adj.), the hot water valve will fully open and the supply fan will start. When space temperature rises to night setback temperature set point the supply fan will stop and the hot water valve will close to the coil.

d) Summer: If the outside air temperature drops 5°F (adj.) below the night setback cooling temperature (75°F adj.) the fan shall energize and the damper shall modulate towards the full outdoor air position. The hot water valve shall remain fully closed and the face-and-bypass damper shall modulate to the full bypass position. Once the thermostat is satisfied the unit shall return to standby.

6. Demand Ventilation Mode

a) If CO2 level rises above high limit set point of 900 PPM (adjustable), as sensed at space CO2 sensor, the damper function will be overridden and the outdoor air damper will modulate towards full open position, as required to maintain CO2 level below CO2 high limit set point. When CO2 level is maintained below high limit set point, normal control as described above will resume. The outdoor air function will be limited by the discharge air temperature sensor to prevent the discharge air temperature from falling below 50°F (adjustable).

7. Increased Ventilation Mode

a) Occupied Mode minimum outside air flow rates shall be increased to 2x (adj) the baseline minimum ventilation rate or the maximum scheduled ventilation rate, whichever is smaller.

b) Unoccupied Mode minimum outside air flow rates shall be set to 10% (adj) of the scheduled ventilation rate.

c) Increased ventilation mode shall be manually enabled/disabled at the BMS head end.

8. Safeties

a) Low Temperature Detection: Manual reset low limit thermostat, serpentined across the downstream side of the hot water coil, will stop the supply fan, position the damper to full return air, fully open the hot water valve, modulate the face-and-bypass damper to full bypass, and generate an alarm at the central operator's work station whenever the hot water coil discharge temperature is 38°F or below. When the low limit thermostat is manually reset, the alarm will be cancelled and normal control will resume.

9. Monitored Points

a) In addition to points required to properly execute the sequence of operations and safeties the following points shall be monitored:

(i) Discharge Air Temperature (°F)

(ii) Space Temperature (°F)

(iii) Fan Status (On/Off)

(iv) Face and Bypass Damper Position (% face)

(v) OA Damper Position (% open)

b) Controls contractor shall coordinate with UV manufacturer regarding the furnishing and installation of all required sensors, actuators, and controller.

L. Fan Coil Controls

1. Unit ventilator shall operate as primary source of cooling and heating within room.
2. Occupied/Unoccupied Modes
    a) The Fan coil controller will be commanded to occupied/unoccupied control via an adjustable time schedule residing in a network resident scheduling device. Space sensor provides an unoccupied override push button that allows occupied control for a period of time as set in controller.
3. Morning Warm-up Mode
    a) Morning warm-up mode will pre-start the unit vent in order to heat the space to occupied set point by the beginning of scheduled occupancy time. If space temperature as sensed at space temperature sensor is below occupied set point the damper will be positioned to full return air, hot water valve shall provide full flow to the coil, When space temperature reaches occupied set point, warm-up mode will end and the unit vent will operate in normal occupied mode.
4. Occupied Mode
    a) The supply fan will start and run continuously. When fan operation has been proven by the current switch, the outdoor air dampers will modulate to introduce minimum outdoor air to the space and occupied control will be enabled.
    b) Winter: If space temperature falls below occupied heating set point (adjustable) as sensed at space temperature sensor, the outdoor air damper will remain at minimum outdoor air position and the hot water valve will open, and the unit shall modulate the space temperature set point. As space temperature rises to set point, the hot water valve will modulate closed and the unit shall modulate to full bypass.
    c) Summer: If space temperature rises above occupied cooling set point (adjustable), the hot water valve will remain closed to the coil and the damper will modulate towards the full outdoor air position, as required, allowing outdoor air into the space.
5. Unoccupied Mode
    a) Summer Standby: The supply fan will be operate, the damper will be positioned to full return air and the hot water valve will be fully closed to the coil.
    b) Winter Standby: The discharge air temperature sensor will modulate the hot water valve, as required, to maintain a minimum “warm box” temperature set point of 55°F (adjustable).

c) Winter: If space temperature falls below reduced night setback temperature heating set point (65°F adj.), the hot water valve will fully open. When space temperature rises to night setback temperature set point the and the hot water valve will close to the coil.

d) Summer: If the outside air temperature drops 5°F (adj.) below the night setback cooling temperature (75°F adj.) the damper shall modulate towards the full outdoor air position. The hot water valve shall remain fully closed.

6. Safeties

a) Low Temperature Detection: Manual reset low limit thermostat, serpentined across the downstream side of the hot water coil, will stop the supply fan, position the damper to full return air, fully open the hot water valve, modulate the face-and-bypass damper to full bypass, and generate an alarm at the central operator's work station whenever the hot water coil discharge temperature is 38°F or below. When the low limit thermostat is manually reset, the alarm will be cancelled and normal control will resume.

7. Monitored Points

a) In addition to points required to properly execute the sequence of operations and safeties the following points shall be monitored:

(i) Discharge Air Temperature (°F)

(ii) Space Temperature (°F)

(iii) Fan Status (On/Off)

(iv) OA Damper Position (% open)

b) Controls contractor shall coordinate with fan coil manufacturer regarding the furnishing and installation of all required sensors, actuators, and controller.

M. Exhaust Fans:

1. CEF-1 & CEF-3 to be interlocked with light switches.
2. CEF-2 shall operate continuously.

END OF SECTION

SECTION 26 00 00 ELECTRICAL

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.
B. This Contractor shall also include allowances for startup and for making the systems fully operational, and for scope and design contingencies. Future changes in price for items not shown on these drawings will not be allowed if the system itself is shown on these Drawings.
C. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.
D. The drawings show the layout of the electrical systems and indicate the approximate locations of outlets, apparatus, and equipment. The runs of feeders and branches as shown on the drawings are schematic only. The exact routing of branch circuits and feeders shall be determined by the structural conditions and possible obstructions. This shall not be construed to mean that the design of the systems may be changed but refers only to exact runs between given points. The Engineer reserves the right to revise the drawings from time to time to indicate changes in the work.
E. The Contractor shall consult and review all contract and reference drawings which may affect the location of any outlets, apparatus and equipment to avoid any possible interference and permit full location of outlets, apparatus and equipment up to the time of rough-in is reserved by the Engineer and such change shall be made without additional expense to the Owner.
F. It shall be the responsibility of this Contractor to see that all electrical equipment such as junction and pull boxes, panelboards switches, controls and such other apparatus as may require maintenance and operation from time to time is made accessible. Although the equipment may be shown on the drawings in certain locations, the construction may disclose the fact that such locations do make its position accessible. In such cases this Contractor shall call the attention of the Engineer to the condition before advancing the construction to a state where a change will reflect additional expense to the Owner.

1.2 SUMMARY

A. This Section specifies the basic requirements for electrical installations and includes requirements common to more than one section of Division 26. It expands and supplements the requirements specified in sections of Division 1.
B. These documents have been prepared with the intention that they call for finished, tested work, in full operating condition and complete with necessary accessories.
C. The contract drawings are generally diagrammatic and convey the scope of work and general arrangement of apparatus and equipment. The locations of all items shown on the drawings or called for in the specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project and shall have the approval of the Architect/Engineer before being installed. The Contractor shall follow the drawings in laying out work and shall check drawings of the other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. If directed by the General Contractor, Engineer and/or Architect, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.
D. These contract documents are complementary. What is called for by one shall be as binding as if called for by all. Materials or work described in words, which have well-known technical, or trade meaning shall be held to refer to such recognized standards. Incidental devices and accessories needed for

complete, operational systems shall be provided even though they may not be indicated or identified in the documents.

E. If apparatus have been omitted, notify the Architects/Engineers of such belief. It is understood that bidder has included all required items and work in his bid, and will not if bid is successful, claim extra compensation for furnishing a complete and satisfactory system. If a particular item is called for or specified more than once in these contract documents, the higher grade shall be considered specified.
F. Should it appear that the character of the work is not sufficiently explained in these specifications or on the drawings, apply to the A/E for further information. Conform to the A/E's decision and directions as shall become part of these contract documents. The A/E reserves the right to be sole interpreter of the drawings and specifications, and all decisions shall be conclusive, final and binding on the parties.
G. Materials called for in these documents shall be new, unused equipment and of the latest recognized standards.
H. The work to be done under Division 16 is shown on the electrical drawings.

1.3 OUTLINE SCOPE OF WORK

A. The work under this contract, without limiting the generality thereof, includes all materials, labor, equipment, services, and transportation, unless otherwise specified, necessary to complete all systems of electrical wiring and equipment required by the drawings and/or as specified herein. It is the intent of this section and accompanying electrical drawings that these systems be furnished complete in every respect. The Electrical Contractor shall furnish all wiring, equipment and labor needed for a complete operating installation.
B. The Electrical Contractor shall fully indemnify the Owner against any damages, removals and alteration work. This is in addition to the requirements of the General Conditions of the Specifications.
C. The Electrical Contractor shall review architectural, interior design and all other trades plans, elevations and details prior to any work and identify any conflicts between furnishings, furniture, art-work, molding, casework, televisions, signage, awnings, canopies, diffusers, fixtures, etc.. and electrical, fire alarm, audio/visual and communications devices shown on the electrical plans and details. The Electrical Contractor shall prepare 8.5” x 11” sketches showing the conflicts and submit to the Architect for resolution prior to any work. Failure of the electrical contractor to coordinate, identify and obtain a field-directive on any conflict herein noted, that results in installed electrical work to be relocated to the Owner/Architects liking shall be the sole-responsibility of the Electrical Contractor. The Electrical Contractor shall assume and cover all costs associated with conflicts not coordinated, identified and submitted to the Architect, inclusive of material, labor, overtime pay, etc.. and shall not affect the project schedule.

1.4 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
B. Refer to equipment specifications in Divisions 2 through 25 for rough-in requirements.

1.5 SURVEYS AND MEASUREMENTS

A. Base measurements, both horizontal and vertical, on established bench marks. Work shall agree with these established lines and levels. Verify measurements at site and check the corrections of same as related to the work.
B. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the A/E.

1.6 EXAMINATION OF SITE

A. Prior to submitting bid, visit the site where the work is to be performed and the materials are to be delivered. Failure in this respect shall not excuse the Contractor from his obligation to supply and install the work in accordance with the plans and specifications and under all conditions, as they exist.
B. By submitting a bid, this Contractor warrants that all specification sections and drawings showing equipment for plumbing, heating, ventilation, air conditioning, electrical, and architectural, have been examined and is familiar with the conditions and extent of work affecting this contract.

1.7 EQUIPMENT AND MATERIALS

A. All equipment and materials for permanent installation shall be the products of recognized manufacturer's and shall be new, unless noted for re-use, without damaged, functional or aesthetic components.
B. New equipment and materials shall:
    1. Be Underwriters Laboratories, Inc. (UL) labeled and/or listed where specifically called for, or where normally subject to such UL labeling and/or listing services
    2. Be without blemish or defect.
    3. Be in accordance with the latest applicable NEMA standards.
    4. Be products, which will meet with the acceptance of the agency inspecting the electrical work. Where such acceptance is contingent upon having the products examined, tested and certified by UL or other recognized testing laboratory, the product shall be so examined, tested and certified.
C. For all equipment, which is to be installed but not purchased as part of the electrical work, the electrical work shall include:
    1. The coordination of their delivery.
    2. Their unloading from delivery trucks driven in to any point on the property line at grade level.
    3. Their safe handling and field storage up to the time of permanent placement in the project.
    4. The correction of any damage, defacement or corrosion to which they may have been subjected.
    5. Their field make-up and internal wiring as may be necessary for their proper operation.
    6. Their mounting in place, including the purchase and installation of all dunnage, supporting members and fastenings necessary to adapt them to architectural and structural conditions.
D. Equipment, which is to be installed but not purchased as part of the electrical work, shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.8 ELECTRICAL INSTALLATIONS

A. All materials and labor called for, specified in Division 16 of the specifications, and or shown on the electrical drawings furnished under this contract shall be provided under Division 16 unless called for otherwise in the Division 16 documents. The word “provide” as used in the Division 16 documents, shall mean to furnish, install, connect up, complete with all accessories ready for operation and warranted.
B. Coordinate electrical equipment and materials installation with other building components. Fully coordinate work with that of other trades. Furnish information in writing that is needed for the coordination of clearances, etc., with the work of others, and such information shall be given in a timely fashion so as not to impede the progress of two or more trades. Confer and resolve the conflict immediately. If so directed by the A/E, prepare composite drawings to resolve any space or clearance conflict.
C. Verify all dimensions by field measurements.
D. Arrange for chases, slots, and openings in other building components to allow for electrical installations.

E. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
F. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
G. Coordinate the cutting and patching of building components to accommodate the installation of electrical equipment and materials.
H. Where mounting heights are not detailed or dimensioned, the exact location shall be determined by the A/E, install electrical services and overhead equipment to provide the code and/or utility requirements.
I. Install electrical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
J. Coordinate the installation of electrical materials and equipment above ceilings with suspension systems, mechanical equipment and systems, and structural components.
K. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
L. Attention is directed to areas and items indicated on the drawings by the notations "HOLD", "N.I.C.", "BY OTHERS" and words of similar intent. The work indicated in these areas is shown for information and continuity only. Work or items furnished and installed in these areas solely for the convenience of this Contractor or others, without prior written approval of the Owner, shall be removed at the option of the Owner and at the Contractor's expense.
M. Provide all required staging and scaffolding for all the work under this section.

1.9 ALTERATION WORK

A. Maintain continuity of service in areas where occupancy is to be maintained during alterations. If it becomes necessary to disconnect or interrupt service, obtain written consent of the Owner, and only disconnect service at the convenience of, and with the consent of the Owner. A copy of the written request for a shutdown shall be forwarded to the A/E.

1.10 CUTTING AND PATCHING

A. Cutting and patching of electrical equipment, components, and materials specified under Division 16 (conduit, sleeves, equipment, etc.) shall be performed by Electrical Contractor.
B. Refer to the Conditions of the Contract (General and Supplementary) and Division 1 Section: "Cutting and Patching" for definitions, requirements, and procedures.
C. Cutting and patching of existing structures (thru walls, floors, ceilings, etc.) to accommodate equipment, components, and materials of all Contractors, including Mechanical and Electrical Contractors, shall be performed by General Contractor and/or his designated Subcontractor.
D. Cutting and patching of new structures (thru walls, floors, ceilings, etc.) to accommodate installation of ill-timed work or removal and replacement of defective work or work not conforming to requirements of Contract Documents, shall be performed by General Contractor and/or his designated Subcontractor and costs shall be back charged to appropriate trade Contractor.
E. Do not endanger or damage installed work through procedures and processes of cutting and patching.
F. Arrange for repairs required to restore other work, because of damage caused as a result of electrical installations.
G. Arrange to have ducts, raceways, conduit, panelboards, boxes, and such other pertinent parts, set in place ahead of construction work so that they will be built-in with structures and eliminate need for cutting and patching. Failure to conform to this paragraph will require that this Contractor perform any cutting and patching required for his work at his expense. Cutting shall be neatly finished to match adjoining work in a manner acceptable to the A/E. Cutting and patching shall not affect the fire rating of walls or structural parts. Cutting and patching required to correct work, due to error or negligence of the Contractor, or to defects in his material or workmanship, shall be corrected at no additional cost to

the Owner. Patching shall meet or exceed quality of adjacent surfaces. Cutting must be accomplished as not to weaken adjacent structural members and must be approved by the Structural Engineer before proceeding.

H. Perform cutting, fitting, and patching of electrical equipment and material required to:
    1. Uncover work to provide for installation of ill-timed work.
    2. Remove and replace defective work.
    3. Remove and replace work not conforming to requirements of the contract documents.
    4. Remove samples of installed work as specified for testing.
    5. Install equipment and materials in existing structures.
    6. Upon written instructions from the A/E, uncover and restore work to provide for A/E observation of concealed work.

I. Cut, remove and legally dispose of selected electrical equipment, components and materials as indicated, including, but not limited to, removal of electrical items indicated to be removed and items made obsolete by the work.

J. Protect the structure, furnishing, finishes, and adjacent materials not indicated or scheduled to be removed. Protect the electrical work and the work of others in a manner best suited to the particular case. Correct any damage done to any work at no additional cost.

K. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

L. Locate, identify, and protect electrical services passing through areas that are to under-go remodeling or demolition. Electrical services serving other areas required to be maintained, and transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to changeover.

1.11 SUBMITTALS

A. Within fifteen (15) business days after the date of notice to proceed and before purchasing any materials or equipment, submit for approval a complete list, in six (6) copies, of all materials to be incorporated in the work.

B. Shop drawings/manufacturer's cuts are required for:
    1. Wire & Cable.
    2. Lighting Fixtures.
    3. Panelboards.
    4. Transformers.
    5. Disconnect Switches.
    6. Fire Alarm System.
    7. Wiring Devices and Plates.
    8. Fire Stopping Materials.
    9. Seismic Restraint Components.

C. After the list has been processed, submit complete shop drawings of all equipment. These shop drawings submittals shall be submitted within thirty days after the processing date of the original submittal.

D. All submittals shall be complete and submitted electronically to all applicable parties. No consideration will be given to partial submittals except with prior approval. No consideration will be given to faxed submittals.

E. Explanation of Shop Drawing Stamp:
    1. Approved: indicates that we have not found any reason why this item should not be acceptable within the intent of the documents.
    2. Approved with Comments: indicates that we have found questionable components which, if corrected or otherwise explained, make the product acceptable.
    3. Resubmit for Final Review: indicates that this item should be resubmitted for approval before further processing.
    4. Does Not Conform: indicates that the item will not meet the intent of the Contract.

F. No shop drawing stamp or note shall constitute an order to fabricate or ship. Such notification can only be performed by the Project Manager for construction, the Contractor scheduling his own work, or the Owner.
G. Submittal of shop drawings, product data, will be reviewed only when submitted by the Contractor. Data submitted from Sub-contractors and material suppliers directly to the A/E will not be processed.
H. If shop drawing is not in compliance after two submissions, a third submission for the same manufacturer will not be considered for review.
I. Check shop drawings and other submittals to assure compliance with contract documents before submittal to A/E.
J. Review of shop drawings is final and no further changes shall be considered without written application. Shop drawing review does not apply to quantities, dimensions, nor relieve this Contractor of his responsibility for furnishing materials or performing his work in full compliance with these contract drawings and specifications. Review of these shop drawings shall not be considered a guarantee of the measurements of this building or the conditions encountered.
K. General requirements for the substitution of equipment and submittal of shop drawings as follows. If apparatus, systems or materials are substituted for those specified, and such substitution necessitates changes in, or additional connections, wiring, supports, or construction, it shall be provided by this Contractor at no additional cost to the Owner. This Contractor shall assume all cost and entire responsibility thereof. The approval of substituted equipment does not relieve the contractor of his/her responsibility of shop drawing errors related to details, sizes, quantities, wiring diagram arrangements and dimensions which deviate from the Specifications, and/or job conditions as they exist. It is the contractor's responsibility to submit only those items that meet the specified apparatus, systems and material. Should any non-conformance code items be installed, they shall be replaced by this Contractor at no additional cost to the Owner. The construction means and methods used in the project shall be reviewed and approved through the local building department or a deputy inspector to insure compliance with the current codes, project specifications and general building practices.
L. Coordination drawings shall be submitted and shall show all HVAC, Electrical, Plumbing and Fire Protection systems superimposed in order to identify conflicts and ensure inter-coordination of all trades. Coordination drawings shall be initiated under this Section of the Specifications. It is this Contractors responsibility for preparation of project coordination drawings showing the installation of all electrical equipment, switchgear, motor control centers, panelboards, transformers, transfer switches, disconnect switches, enclosed circuit breakers, conduits, outlets, switches and accessories to be provided under this Section of the Specifications. These drawings shall be prepared at not less than 3/8 in. = 1 ft. scale, and shall show building room layouts, structural elements, ductwork and lighting layouts of function. A reproducible copy of each drawing prepared shall then be submitted to the Mechanical, Plumbing and Sprinkler Contractors, who shall be responsible to coordinate his equipment and systems and shall show these on the drawings submitted. After this Contractor has fulfilled his obligation, he shall notify all other Contractors. After each drawing has been coordinated between trades, each trade shall sign each drawing, indicating acceptance of the installation. This Contractor shall then print the coordination original and these prints submitted through the General Contractor to the architect for review and comment, similar to shop drawings. Comments made on these drawings shall result in a correction and re-submittal of the drawings. A Subcontractor who fails to promptly review and incorporate his work on the drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications. Review of coordination drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

1.12 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Refer to the Conditions of the Contract (General and Supplementary) and Division 1 for definitions, requirements, and procedures.
B. If materials of equipment are substituted for specified items that alter the systems shown or its physical characteristics, or which have different operating characteristics, clearly note the alterations or

differences and call it to the attention of the A/E. Under no circumstances shall substitutions be made unless identical material or equipment has been successfully operated for at least three consecutive years.

C. All substitution made by the Contractor shall require the Contractor to fully coordinate the substitution with other trades. The Contractor must make any modifications required by the substitution at no additional cost to the Owner. In addition the Contractor must notify the A/E of any changes required and obtain approval for the changes. The review of the shop drawings by the A/E shall not relieve the Contractor from his responsibility as set forth in this specification.

1.13 NAMEPLATE DATA

A. Provide permanent operational data nameplate on each item of power operated equipment, conduits with pull string, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in a readily accessible location.

1.14 DELIVERY STORAGE AND HANDLING

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage. All devices shall be stored in a locked room. Assume responsibility for the devices until the date of final inspection.
C. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.15 RECORD DOCUMENTS

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.
B. At completion of work prepare a complete set of Record As-Built Drawings in AutoCAD, Computer Aided Drafting (CAD) software, showing all systems as actually installed, including all fire alarm and electrical circuitry. The Record As-Built Drawings computer files shall be made available to the Architect, Engineer and Owner prior to final payment.
C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Electrical Contractor.
D. This trade shall submit the record set for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.
E. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.16 WARRANTIES

A. Refer to the Conditions of the Contract (General and Supplementary) and Division 1 for definitions, requirements, and procedures.
B. All work and equipment furnished under this Section shall be guaranteed free from defects in workmanship or materials for a period of one (1) year, unless specifically noted otherwise for a particular system, from the date of final acceptance of the systems as set forth in this Contract. The Subcontractor shall replace any defective work developing during this period, unless such defects are clearly the result of misuse of equipment by persons not under the control of the Subcontractor, without cost to the Owner. Where such defective work results in damage to work of other Sections, all such work shall be restored to its original condition by mechanics skilled in the affected trade, at the expense of the Subcontractor. The Subcontractor shall submit a separate written guarantee stipulating the aforesaid conditions.
C. Prior to or at the time of Substantial Completion for the work and during administrative close-out of the project, submit one (1) copy of all specified warranties and guarantees to the Architect for review, approval and subsequent transmittal to the Owner.
D. Warranties and guarantees, including those specified in excess of the general one (1) year guarantee, shall be complete for all specific materials, systems, sub-systems, equipment, appliances and products specified and required by the Contract Document.
E. Warranties and guarantees shall clearly define what is to be guaranteed; the extent, terms, conditions, time and effective dates.
F. Copies of the same warranties and guarantees shall be included in the “Operating and Maintenance Manual” as specified herein.

1.17 CLEANING

A. Refer to the Conditions of the Contract (General and Supplementary) and Division 1 for definitions, requirements, and procedures.
B. Upon completion of work, the Contractor shall clean, polish and leave bright, fixtures and lamps, and shall remove dust, dirt, debris and loose plaster from panelboards, controls, and switchboards. Unused openings in pull boxes, junction boxes, equipment and raceways shall be capped or closed by an approved means. Replace all inoperative lamps.

1.18 DEFINITION OF TERMS

A. "This Contractor" or "E.C." specifically means, the Electrical Contractor working under this section of the specifications.
B. "Concealed" means hidden, in chases, furred spaces, walls, above ceilings or enclosed in construction.
C. "Exposed" means visible in sight or not installed "concealed" as defined above.
D. "Approved Equal" means any equipment or material which is approved by the Engineer and equal in quality, durability, appearance, strength, design and performance to the equipment or material originally specified.
E. "Conduit" shall mean all conduit including fittings, joints, hangers and supports.
F. "Furnish" shall mean to purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the electrical work.
G. "Install" shall mean to perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the electrical work.
H. "Provide" shall mean to furnish and install.

1.19 QUALITY ASSURANCE

A. Obtain services of manufacturer's representatives of electrical equipment, during erection and construction of their respective equipment to insure proper installation of same.
B. A letter is required from each system manufacturer's representative certifying to the A/E that requirements have been checked and are properly installed and operating.

1.20 PERFORMANCE TESTS - ELECTRICAL

A. Test and adjust the electrical systems and equipment during the progress of the work.
B. Upon completion of work and after preliminary tests to assure that all systems are complete and in proper working order, arrange with the A/E to conduct performance tests of the electrical systems. These tests may be witnessed by the A/E prior to acceptance of systems and shall be arranged for the purpose of demonstrating compliance with contract documents. During this period, visually inspect all electrical equipment. Lighting fixtures shall be tested with specified lamps in place for not less than six (6) hours. Check voltages to assure that all transformer taps are properly set.
C. General operating tests shall be performed under as near design conditions as possible, for a period of not less than one (1) hour for each system, and shall demonstrate that all equipment is functioning in accordance with specifications. Furnish all instruments, ladders, test equipment and personnel required for tests. Any equipment or systems found by test to be deficient or unsatisfactory shall be replaced and tests repeated as often as necessary to assure compliance with contract documents.
D. Test all feeders, sub-feeders and all branch wiring for amperage, voltage, phase balance, phase sequence of A,B,C and insulation resistance, then submit the results of this test to the A/E neatly typed in triplicate for review. This test may be conducted at any time up to, through and including, the guarantee period if requested by the A/E, at no additional cost to the Owner.
E. Phase balance the complete electrical system, phase balance all panels as near as loads will permit under normal working conditions.
F. Test all ground conductors for current flow, as near design operating conditions as possible. If any measured current exceeds one (1) ampere, determine and correct the cause. Also, if measured resistance is greater than 5 ohms indoor or 10 ohms outdoor, determine and correct the cause.
G. During the progress or completion of the work it shall be subject to the inspection of the Owner and to such other inspectors, as may have jurisdiction, including those of the Electric Company, Fire Department and the Telephone Company.
H. The Contractor shall be responsible for correct voltages, tap settings, trip settings and correct phasing on all equipment. Secondary voltages shall be measured at the line side of the main breakers with the breakers in an open position, at panelboards, and at such other location on the distribution systems and branch circuits as directed by the Engineer.
I. At completion of the work, Contractor shall submit to the Owner's representative in writing a statement stating: (1) that the work is complete; (2) that the entire installation is in accordance with the drawings and specifications; (3) that preliminary tests have been made; and (4) that the work is ready for final inspection and test.
J. A final inspection of the installation to determine compliance with the drawings and specifications will be made by the Owner's representative. Work will be checked for quality of materials, quality of workmanship, proper installation and finished appearance. The electrical contractor shall provide the services of the project electrical foreman for inspection purposes. The foreman shall remove and reinstall wiring devices, junction box covers, panelboard trims, switchboard covers, terminal box covers, ceiling tiles, lighting fixtures, etc. as required to facilitate any inspections required by the Owner's representative.
K. The Contractor shall arrange and conduct operating tests on all equipment in the presence of the Owner's representative. The components parts of systems and the various systems shall be demonstrated to operate in accordance with the requirements and intent of this specification. Any non-complying or defective materials or workmanship disclosed as a result of the inspection and tests shall be corrected promptly by the Contractor, and the tests repeated as often as necessary until approved and accepted by the Owner's representative.
L. The Contractor shall visit the site to acquaint himself with existing conditions. No extra compensation will be paid for failure to comply with this paragraph.
M. The Electrical Contractor shall provide supervision, labor, materials, tools, test equipment, and all other equipment or services and expenses required to test, adjust, set, calibrate, and operationally check work and components of the electrical systems and circuitry throughout this section.
N. The electrical contractor shall pay for all tests including expences incident to retests occasioned by defects and failures of equipment to meet specifications at no additional cost to the owner.

O. Any defects or deficiencies discovered in any of the electrical work shall be corrected at no cost to the owner.
P. All testing shall be compatible with the manufacturer's installation instructions.

1.21 SEISMIC RESTRAINT

A. It is the intent of this seismic specification to keep all electrical building system components in place during a seismic event.
B. All electrical systems must be installed in strict accordance with seismic codes, component manufacturer's and building construction standards. Whenever a Conflict occurs between the manufacturer's or construction standards, the most stringent shall apply.
C. This contractor shall engage a professional structural engineer registered in the jurisdiction of this project to review the entire installation to determine all seismic restraint requirements and methods. Contractor shall submit a report outlining the structural engineer's review as well as seismic restraint shop drawings and supporting calculations prepared by the professional structural engineer for review by the Architect.
D. Seismic restraints shall be designed in accordance with seismic force levels as detailed in the applicable building code.

1.22 TEMPORARY LIGHT AND POWER

A. Under this Section of the specifications, this Contractor shall provide temporary electric service, sized suitable for construction for each trade. This contractor shall provide all material and labor for temporary electrical service per the local power company's requirements and standards with all necessary panelboards, disconnect switches, transformers, conduit, wiring, etc. as required. This contractor shall pay all associated costs, up front.
B. Where temporary electrical service cannot be obtained from the local power company, this contractor shall provide a temporary, on-site, electric generator with all necessary panelboards, disconnect switches, transformers, conduit, wiring, etc. as required. The fuel used for the generator shall be provided and paid for by this Contractor.
C. This contractor shall provide a distribution system with circuits for receptacles and lighting as required for construction. This contractor shall maintain the temporary electrical system during construction and remove the system when construction is complete.
D. Under this section of the specifications, this Contractor shall provide and maintain temporary lighting based on using not less than one 100-watt lamp for each 100 square feet of building floor area and one duplex GFCI receptacle for each 200 square feet of building floor area. Where higher lighting intensities are required by Federal or State laws or otherwise specified, the above specified wattage shall be increased to provide the increase intensities.
E. This contactor shall provide temporary power and telephone services from the local telephone company for site trailers, fax machines, computers, etc., per the general contractor's direction.
F. The service shall incorporate ground fault protection and comply with NEC Article 527 and OSHA requirements.

1.23 PERMITS

A. Obtain all required electrical permits and pay all fees for same.
B. Provide to Engineer, in duplicate, a certificate of final inspection from the authority having jurisdiction for the electrical and systems.

1.24 OPERATING, INSTRUCTION, AND MAINTAINANCE MANUALS

A. Refer to Section 01700 – CONTRACT CLOSEOUT for submittal procedures pertaining to operating and maintenance manuals.

B. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed.

1.25 BIDDERS REPRESENTATION

A. By the act of submitting a bid for the proposed contract, the Bidder represents that:
   1. The Bidder and all subcontractors the Bidder intends to use have carefully and thoroughly reviewed the drawings, specifications and other construction contract documents and have found them complete and free from ambiguities and sufficient for the purpose intended; further that,
   2. The Bidder and workmen, employees and subcontractors the Bidder intends to use are skilled and experienced in the type of construction represented by the construction contract documents bid upon; further that,
   3. Neither the Bidder nor any of the Bidder's employees, agents, intended suppliers or subcontractors have relied upon any verbal representations, allegedly authorized or unauthorized from the Owner, or the Owner's employees or agents including architects, engineers or consultants, in assembling the bid figure; and further that,
   4. The bid figure is based solely upon the construction contract documents and properly issued written addenda and not upon any other written representation.

1.26 UTILITY COMPANY & AGENCY COORDINATION

A. This section includes, but is not limited to coordination with the following utilities, agencies and authorities having jurisdiction:
   1. Local Fire Marshal: This contractor shall verify with the local fire alarm official, the type of master-box or municipal connection required for this project. This contractor shall provide all material & labor to comply with the local municipality. Notify Engineer of discrepancies between the plans and the municipality's standards. No extra compensation will be given for corrections required for failure to coordinate with the municipality, but corrections shall be made.
   2. Electrical Inspector: Review plans and specifications with the local electrical and/or wiring inspector(s). Obtain and pay for all permits.
   3. Building Inspector: Review plans and specifications with the local building inspector, if not done so by the General Contractor.
   4. OSHA Representative: Review plans and specifications with the local OSHA representative, if not done so by the General Contractor.
   5. Dig Safe: This contractor shall notify and coordinate with Dig Safe prior to any excavation; digging; trenching; grading; tunneling; augering; boring; drilling; pile driving; plowing-in or pulling-in pipe, cable, wire, conduit, or other sub-structure; backfilling; demolition; and blasting related to this Contractor.
B. The Electrical Contractor shall pay for all permits, inspections, labor, material and fees associated with the various Utility Companies coordination requirements mentioned in this section and for this Contractor's work under this project.
C. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structural and other trades and to meet Architectural requirements.
D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the electrical work shall interfere with the work of other trades, assist in working out the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owners, make reasonable modifications to the work as required by normal structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through

concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any electrical work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the trades involved without extra cost to the Owners.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect and Engineer for review and approval.

PART 2 – PRODUCTS

2.1 CONDUIT

A. Minimum Size: ¾-inch, unless otherwise specified.

B. Underground Installations:
   1. More than Five Feet from Foundation Wall: Use thick wall nonmetallic conduit concrete encased.
   2. Within Five Feet from Foundation Wall: Use rigid steel conduit concrete encased.
   3. In or Under Slab on Grade: Use plastic coated conduit.
   4. Minimum Size: 1-inch.

C. Outdoor Locations, Above Grade: Use rigid steel conduit.

D. In Slab Above Grade:
   1. Use rigid steel conduit.
   2. Maximum Size Conduit in Slab: ¾ inch (19 mm); ½ inch (13 mm) for conduits crossing each other.

E. Wet and Damp Locations: Use rigid aluminum conduit.

F. Dry Locations:
   1. Concealed and in Cable-Tray: Use metal clad (MC) cable (see Division 1)
   2. Exposed: (Unfinished or utility spaces) Use electrical metallic tubing.

G. Metal conduit: Rigid Steel Conduit shall comply with ANSI C80.1 and be heavy wall zinc coated steel. Rigid Aluminum Conduit shall comply with ANSI C80.5. Intermediate Metal Conduit (IMC) shall be rigid steel. Fittings and Conduit Bodies shall comply with ANSI/NEMA FB 1 and material to match conduit. Acceptable manufacturers are Western Tube and Conduit Company, Allied Tube and Conduit Company and Triangle Wire and Cable, Inc.

H. Flexible metal conduit shall be interlocked aluminum contruction. Fittings shall comply with ANSI/NEMA FB 1. Acceptable manufacturers are AFC Cable Systems, Electri-Flex Company and Eastern Flexible Conduit Technologies. All flexible conduits shall include a grounding conductor.

I. Electrical metallic tubing (EMT) shall comply with ANSI C80.3; galvanized zinc coated steel tubing. Fittings and Conduit Bodies shall comply with ANSI/NEMA FB 1; steel, compression or set screw type. Acceptable manufacturers are Western Tube and Conduit Company, Allied Tube and Conduit Company and Triangle Wire and Cable, Inc.

J. Nonmetal conduit shall comply with NEMA TC 2; Schedule 40 PVC, or as indicated on plans. Fittings and Conduit Bodies shall comply with NEMA TC 3. Acceptable manufacturers are Carlon or approved equal.

K. Flexible nonmetallic conduit (Sealtite) shall be UL and CSA listed for purpose specified and shown. Acceptable manufacturers are Carlon or approved equal.

L. Install conduit in accordance with NECA "Standard of Installation." Install nonmetallic conduit in accordance with manufacturer's instructions.

M. Arrange supports to prevent misalignment during wiring installation. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits. Fasten conduit supports to building structure and surfaces under provisions of Division 1. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports. Do not attach conduit to ceiling support wires.

N. Arrange conduit to maintain headroom and present neat appearance. Route exposed conduit parallel and perpendicular to walls. Route conduit installed above accessible ceilings parallel and perpendicular to walls. Route conduit in and under slab from point-to-point. Do not cross conduits in slab.
O. Maintain adequate clearance between conduit and piping. Maintain 12-inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
P. Cut conduit square using saw or pipe cutter; de-burr cut ends. Bring conduit to shoulder of fittings; fasten securely. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
Q. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2 inch (50 mm) size.
R. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints. All expansion and deflection fittings shall have a ground strap. Provide suitable pull string in each empty conduit except sleeves and nipples. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
S. Ground and bond conduit under provisions of NEC 250.

2.2 BUILDING WIRE & CABLE

A. Building Wire and Cable shall be copper with 600V insulation rated at 75°C minimum, Type XHHW insulation for feeders and branch circuits larger than #3 AWG; Type THHN/THWN insulation for feeders and branch circuits #4 AWG and smaller.
B. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.
C. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.
D. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors “white” or “gray”. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or along their entire extensions beyond raceway ends, whichever is less.
E. Final connections to motors shall be made with 18” of neoprene sheathed flexible conduit.
F. Minimum branch circuit conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.
G. Fire alarm and security system wiring shall be No. 16 twisted non-shielded pairs for alarm and trouble circuits and a minimum of #14 AWG for device power, control and alarm annunciation circuits. Fire alarm system riser circuits shall be 2-hour rated, CI type (circuit integrity) cable per NFPA 72 and NEC 760.
H. Other wires and cables required for the various systems described elsewhere in this section of the Specifications shall be as specified herein, as shown on the Contract Drawings, or as recommended by the manufacturer of the specific equipment for which they are used, all installed in conduit.
I. Metal clad sheathed cable NFPA 70, type MC may be used for branch circuitry where shown and where run concealed and not subject to physical damage. All branch circuits shall be run in conduit from the panelboard to the first outlet. All type MC cable used shall contain a full size insulated ground conductor. All conductors shall be copper. All type MC cable insulation used shall have voltage rating of 600 volts, shall have a temperature rating of 75° C, and shall be thermoplastic material. Armor material shall be steel and armor design shall be interlocked metal tape. Fire alarm rated MC cable may be used for fire alarm work where concealed and approved by the Authority Having Jurisdiction.

J. Wiring materials except MI cable shall be manufactured by Triangle, Essex, General Cable, AFC, Southwire or equal.
K. Concealed Dry Interior Locations: Use only building wire Type THHN/THWN or XHHW insulation in raceway, or metal clad cable where concealed and code acceptable.
L. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway.
M. Above Accessible Ceilings: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway or metal clad cable where code acceptable.
N. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway.
O. Exterior Locations: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway.
P. Underground Installations: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway.
Q. Wiring methods, in general, are as follows:
    1. Galvanized rigid steel conduit shall be used for telephone system sleeves for main cable runs between floors, closets, etc. and for sweeps, bends, etc. in ductbanks and as specifically noted on the plans. EMT shall be used generally for exposed circuiting in unfinished spaces. Metal clad cable (type MC) may be used for branch circuiting and fire alarm rated MC cable for fire alarm circuiting where run concealed and where code acceptable.
    2. To prevent transmittal of vibration to conduit, connections to any vibration producing equipment (i.e. transformers, motors, etc.) shall be terminated by 18 inches of flexible metal conduit. Where flexible connections are exposed to grease and oil, liquid-tight flexible metal conduit shall be used.
    3. In general, no splices or joints shall be permitted in either feeders or branches except at outlets or accessible junction boxes. Splices in wire #8 AWG and smaller shall be pigtail type, made mechanically tight. All conduit systems shall be complete.
    4. Raceway, boxes, etc., run on walls in wet areas which are subject to being washed down, shall be mounted on the walls with 1/4" stand-offs. All boxes shall be cast type.
R. Route wire and cable as required to meet the Project Conditions. Install cable in accordance with the NECA "Standard of Installation." Use solid conductor for feeders and branch circuits 10 AWG and smaller. Use stranded conductors for control circuits. Use conductor not smaller than 12 AWG for power and lighting circuits. Use conductor not smaller than 16 AWG for control circuits. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet (25 m). Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet (160 m). Pull all conductors into raceway at same time. Use suitable wire pulling lubricant for building wire 4 AWG and larger. Protect exposed cable from damage.
S. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system, cables that are not part of the ceiling system cannot be supported from ceiling supports. Do not rest cable on ceiling panels. Use suitable cable fittings and connectors. Neatly train and lace wiring inside boxes, equipment, and panelboards.
T. Clean conductor surfaces before installing lugs and connectors. Make splices, taps, and terminations to carry full ampacities of conductors with no perceptible temperature rise. Use suitable reducing connectors or mechanical connector adapters for connecting aluminum conductors to copper conductors. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape un-insulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller. Identify and color code wire and cable. Identify each conductor with its circuit number or other designation indicated.

2.3 BOXES

A. Outlet Boxes:
    1. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations shall be of cast-metal type having

hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps are not allowed in new construction.

2. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of NFPA 70. Boxes shall not be less than 1-1/2" deep unless shallower boxes are required by structural conditions and are specifically approved by Architect. Ceiling and bracket outlet boxes shall not be less than 4" octagonal except that smaller boxes may be used where required by particular fixture to be installed. Flush or recessed fixtures shall be provided with separate junction boxes when required by fixture terminal temperature requirements. Switch and receptacle boxes shall be 4" square or of comparable volume. Luminaire and equipment supporting boxes shall be rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.
3. Provide metallic boxes rated for 2-hour, fire-rated walls with gasket to reduce noise-transmission in all fire-rated walls. A minimum horizontal distance of 24-inches shall separate metallic boxes located on opposite sides of fire walls. This minimum horizontal spacing may be reduced using UL classified wall opening protective materials, commonly known as "putty pads" or "insert pads" pending written approval from the local authority having jurisdiction (AHJ). Refer to Architect's plans for all wall types prior to bid and any related work that will require 2-hour fire ratings.
4. All boxes installed in demising walls separating tenants, electrical room walls, mechanical room walls, conference room walls, nurse's office walls, and other room walls deemed private by the Owner shall be provided with gasket to reduce noise-transmission.
5. All boxes installed in exterior walls shall be provided with appropriate caulking and gaskets to seal off and prevent air leakage. Follow caulking and gasket manufacturer's installation guidelines to ensure correct and effective installation.
6. Acceptable Manufacturers:
    a. Appleton
    b. Crouse Hinds
    c. Steel City
    d. RACO

B. Pull and Junction Boxes: Where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish and install appropriately designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code. Where intermediate cable supports are necessary because of box dimensions, provide insulated removable core brackets to support conductors. Junction boxes are to be equipped with barriers to separate circuits. Where splices are to be made, boxes shall be large enough to provide ample work space. All conductors in boxes are to be clearly tagged to indicate characteristics. Boxes shall be supported independently of raceways. Junction boxes in moist or wet areas shall be galvanized type. Boxes larger than 4-inches square shall have hinged covers. Boxes larger than 12-inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.

C. Fiberglass Handholes shall be die molded glass fiber. Cable Entrance shall be pre-cut 6-inch x 6-inch (150 mm x 150 mm) cable entrance at center bottom of each side. Cover shall be glass fiber weatherproof cover with nonskid finish.

D. Install boxes in accordance with NECA "Standard of Installation." Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

E. Set wall mounted boxes at elevations to accommodate mounting heights indicated or specified in section for outlet device. Electrical boxes are shown on drawings in approximate locations unless dimensioned. Adjust box location up to 10-feet (3m) if required to accommodate intended purpose. Orient boxes to accommodate wiring devices. Maintain headroom and present neat mechanical appearance.

F. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 7.

G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
H. Use flush mounting outlet box in finished areas. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening. Do not install flush mounting box back-to-back in walls; provide minimum 6-inches (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic rated walls. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness. Use stamped steel bridges to fasten flush mounting outlet box between studs. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
I. Use adjustable steel channel fasteners for hung ceiling outlet box. Do not fasten boxes to ceiling support wires. Support boxes independently of conduit. Use gang box where more than one device is mounted together. Do not use sectional box. Use gang box with plaster ring for single device outlets. Use cast outlet box in exterior locations exposed to the weather and wet locations. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations. Set floor boxes level.
J. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.
K. Adjust floor box flush with finish flooring material. Adjust flush-mounting outlets to make front flush with finished wall material. Install knockout closures in unused box openings.

2.4 WIRING DEVICES

A. Provide wiring device type plates for all wall-mounted devices. All wall plates shall be either brushed aluminum or smooth high impact nylon for all public areas as directed by the Architect. Provide galvanized steel for all Utility, Electric and Mechanical Rooms. Colors of wall plates as directed by the Architect.
B. Wiring devices standard for the project (i.e., with no specific type indicated) shall conform to the following:
    1. Visible part colors of wiring devices shall be as directed by the Architect for all public areas. Provide Ivory colored devices for all Utility, Electrical and Mechanical rooms.
    2. Exclude compact type devices.
C. Wiring device switches shall be toggle type, A.C. quiet design, specification grade, 20 amps on 120 volt circuits. Switches shall be mounted 48-inches to center line above finished floor unless noted otherwise. Equivalent 277volt, 20 amp switches shall be used where required.
D. Standard duplex convenience receptacles shall be 125volt, 20 amps, three wire (two circuit wires plus ground), “U-slot” ground NEMA configuration 5-20R, specification grade. Receptacles shall be mounted 18” to center line above finished floor unless noted otherwise. Where indicated on plans provide receptacles with ground fault current interrupters, UL Class A; 20A, 125V.
E. Non-standard convenience receptacles and special purpose power supply receptacles shall be as listed on plans.
F. Use “Hospital-Grade” receptacles in areas of patient care for all healthcare facilities as defined in the National Electrical Code and in nurses’ office areas of schools. Day-care facilities, Preschool and Kindergarten rooms & other areas indicated on the plans shall be tamper resistant type receptacles. When connected to an Essential Electrical System, all “Hospital Grade” receptacles shall be illuminated.
G. Provide ground fault circuit interrupter (GFCI), weather-resistant type receptacles in all wet and damp locations as defined by the National Electrical Code. All outdoor receptacles and where indicated on the plans shall be installed in a weatherproof while-in-use enclosures.
H. Weatherproof Receptacle Enclosures shall be NEMA 3R rated for rain-tight while-in-use, gasketed, impact resistant thermoplastic with hinged gasketed device cover.
I. Provide extension rings to bring outlet boxes flush with finished surface. Clean debris from outlet boxes. Install devices plumb and level. Install receptacles with grounding pole on top. Connect wiring device grounding terminal to branch circuit equipment grounding conductor. Use jumbo size plates for outlets

installed in masonry walls. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

J. Install wall switch 48 inches above finished floor to top of handle. On position, shall be up. Install convenience receptacles 18-inches above finished floor. Install convenience receptacle 6-inches above backsplash of counter. Install dimmer switches 48 inches above finished floor to top.

K. Verify that each receptacle device is energized. Test each receptacle device for proper polarity. Test each GFCI receptacle device for proper operation.

2.5 CABINETS & ENCLOSURES

A. Cabinets shall be as follows: Boxes: Galvanized steel. Box Size: As required and/or indicated on plans. Backboard: Provide 3/4-inch thick plywood backboard for mounting terminal blocks. Paint matte white. Fronts: Steel, flush type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel. Knockouts: As required and/or indicated on plans. Provide metal barriers to form separate compartments wiring of different systems and voltages. Provide accessory feet for free-standing equipment.

B. Hinged Cover Enclosures shall be as follows: Construction: NEMA 250, Type 1, 3R, or 4 steel enclosure, as required and/or indicated on plans. Covers: Continuous hinge, held closed by flush latch operable by key or hasp and staple for padlock. Provide interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel. Enclosure Finish: Manufacturer's standard enamel.

C. Install in accordance with NECA "Standard of Installation." Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner under the provisions of Section 16190. Install cabinet fronts plumb.

D. Clean electrical parts to remove conductive and harmful materials. Remove dirt and debris from enclosure. Clean finishes and touch up damage.

E. ICS 4 - Terminal blocks for industrial control equipment and systems. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts. Provide ground bus terminal block, with each connector bonded to enclosure.

F. Provide grounding provisions for all cabinets/enclosures and bond to grounding system as required per Code.

2.6 GROUNDING & BONDING

A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70 and the following:
   1. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non-metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.
   2. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of each run utilizing grounding bushings and jumpers.
   3. Provide grounding bonds for all metallic conduits of the light and power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.
   4. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this be equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus. Exclude the jumpers where directed. This exclusion will be required where an isolated ground for electronic equipment is to be maintained.

5. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.
6. Bonding conductors on the load size of the service device and equipment grounding conductors shall be sized in relation to the fuses or trip size of the overcurrent device supplying the circuit.
7. The central equipment for the fire protective alarm system and telephone system shall have its grounding terminal connected to the grounding electrode by means of a No. 6 green coded insulated conductor, run in 3/4" conduit. Utilize a ground clamp of a type specifically manufactured for the purpose.
8. Perform inspections and tests listed in NETA ATS, Section 7.13. Document test results in Record Documents.
9. Grounding means shall never exceed 10 ohms when located outdoors, or 5 ohms when located indoors.
10. An acceptable means of grounding is to provide an underground 2” thick, concrete-encased electrode of either ½” diameter, electrically conductive reinforcing bar of #4/0 bare copper conductor (minimum of 20-feet in length) per NEC 250.52(A)(3).

2.7 EQUIPMENT WIRING SYSTEMS

A. Cords & Caps: Manufacturers: Hubbel, Pass & Seymour or Arrow Hart. Attachment Plug Construction: Conform to NEMA WD 1. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment. Cord Construction: ANSI/NFPA 70, Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Motor Control Equipment: Each motor shall have a starter furnished under this Section where it is not being supplied by other sections. Wire and installed under this Section, unless otherwise noted herein or on the drawings.
   1. Connect the motor starting devices for all motors, except where otherwise specifically provided for under other sections, furnish all necessary connections between controllers and motors, in conduit and leave motors ready to start. Change connections, if necessary, to secure proper rotation of motors.
   2. Perform all the necessary wiring in connection with the motor starting and remote control equipment, where so designated, furnished under other sections. Where control or starting equipment is sent to the job as individual units, they shall be installed, wired up complete and left ready for operation under work of this section.
   3. Wiring to motor shall be in rigid conduit with watertight flexible conduit from wall to motor only.

C. Included in the general requirements for motor control equipment wiring and connections, the following specified items shall be performed:
   1. Installation and connection of motor controls which will be furnished under the heating, ventilating and air conditioning section and the plumbing section.

D. Starters by This Contractor: Where starters are not provided under other sections, this Contractor shall furnish starters for motors 1/2 HP and larger and where required by the control sequence for smaller motors and shall be magnetic across the line starters with adjustable overload protection in each phase line, all in NEMA 1 enclosures. Starters shall be solid state or acceptable substitute. Combination starters shall be with fused or non-fusible disconnect as required.
   1. Magnetic starters shall have 120 volt holding circuits, integral transformers, auxiliary contacts as required by the control sequence and integral selector switches with push-to-test pilot lights. One side of each pilot light shall be connected on the load side of the motor starter.
   2. Integral transformers shall have overload protection on the secondary section and, also, the secondary neutral shall be grounded.
   3. Starters shall be as manufactured by Square D Company or General Electric.

E. Temperature control wiring shall be by others as indicated under the heating, ventilating and air conditioning section.

F. Provide a suitable plywood backboard on a wall and/or angle iron or unistrut framework with plywood for all starters. Starters will be installed and wired under this section.
G. All starters shall be located next to the panel feeding same, if panel is in a closet or utility space, unless noted otherwise on the drawings. If panel is located in a finished space (i.e. corridor, gymnasium, etc.) starters shall be located in nearby utility closet or space acceptable to the Engineer.
H. Nameplates: Each starter shall have a 1.0" x 2.5" hot stamped nameplate identifying the unit and panel it is fed from. The lettering shall be white 1/2" high in a black background.
I. Building and Energy Management Systems (BMS/EMS): This contractor shall provide a price to the Mechanical Contractor to provide power and data wiring to all BMS/EMS components requiring same. Coordinate with Mechanical Contractor prior to bid and prior to any work the exact wiring requirements, connections requirements and exact locations for all BMS/EMS components. Such components shall include, but may not be limited to:
    1. Control transformers
    2. Central equipment controllers
    3. BMS controllers
    4. BMS Head-end equipment
    5. Line-voltage thermostats

2.8 SUPPORTING DEVICES

A. Materials and Finishes: Provide adequate corrosion resistance. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products. Steel channel shall be galvanized.
B. Anchors and Fasteners:
    1. Concrete Structural Elements: Use precast insert system, expansion anchors.
    2. Steel Structural Elements: Use beam clamps, or welded fasteners.
    3. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
    4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
    5. Solid Masonry Walls: Use expansion anchors or preset inserts.
    6. Sheet Metal: Use sheet metal screws.
    7. Wood Elements: Use wood screws.
C. Installation: Install products in accordance with manufacturer's instructions. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation". Do not fasten supports to pipes, ducts, mechanical equipment, and conduit. Do not use spring steel clips and clamps. Do not use powder-actuated anchors. Do no drill or cut structural members. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts. Install surface-mounted cabinets and panelboards with minimum of four anchors. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

2.9 ELECTRICAL IDENTIFICATION

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background. Locations: Each electrical distribution and control equipment enclosure, communication cabinets. Letter Size: Use 1/8 inch letters for identifying individual equipment and loads. Use 1/4 inch letters for identifying grouped equipment and loads.
B. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use for identification of individual power receptacle faceplates indicating panel & circuit number the outlet is fed from and control device stations. In addition to nameplates as described above, use labels on all panelboards, disconnect switches and enclosed circuit breakers to identify where the equipment is fed from, voltage & phase.
C. Wire markers: Tape, or tubing type wire markers. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection. Power and Lighting Circuits shall be

marked with panel and branch circuit or feeder number as indicated on drawings. Control Circuits shall be marked with control wire number indicated on schematic and interconnection diagrams on drawings

D. Conduit markers: Corrosion and abrasion resistant. Location: Furnish markers for each conduit longer than 6 feet (2 m). Spacing: 20 foot on center. Indicate voltage and phase.
E. All panelboards shall be provided with a typed (hand written is not allowed) circuit directory indicating the load fed by each circuit breaker and it's location in the building.

2.10 TWO-WINDING TRANSFORMERS

A. Division 1 - Material and Equipment: Product Options and Substitutions.
B. Manufacturers:
   1. Square D Company.
   2. Cutler Hammer
   3. Siemens
   4. Substitutions: Under the provisions of Division 1.
C. Description: NEMA ST 20, factory-assembled, air cooled dry type transformers, ratings as indicated in schedule on plans. Transformers shall comply with NEMA TP-1, Energy Star Requirements and Department of Energy Efficiency Standards.
D. Primary Voltage: 480 volts, 3 phase unless otherwise noted on plans.
E. Secondary Voltage: 208Y/120 volts, 3 phase unless otherwise noted on plans.
F. Insulation system and average winding temperature rise for rated kVA as follows:
   1. 1-15 kVA: Class 185 with 115 degrees C rise.
   2. 16-500 kVA: Class 220 with 115 degrees C rise.
G. Case temperature: Do not exceed 35 degrees C rise above ambient at warmest point at full load.
H. Winding Taps:
   1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
   2. Transformers 15 kVA and Larger: NEMA ST 20.
I. Sound Levels: NEMA ST 20.
J. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger.
K. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
L. Mounting:
   1. 1-15 kVA: Suitable for wall mounting.
   2. 16-75 kVA: Suitable for wall, floor, or trapeze mounting.
   3. Larger than 75 kVA: Suitable for floor or trapeze mounting.
M. Coil Conductors: Continuous windings with terminations brazed or welded.
N. Enclosure: NEMA ST 20, Type 1. Provide lifting eyes or brackets.
O. Isolate core and coil from enclosure using vibration-absorbing mounts.
P. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.
Q. Set transformer plumb and level.
R. Use flexible metal conduit, 2-feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
S. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.
T. Mount floor-mounted transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure. Provide 4" high concrete housekeeping pad for transformers.
U. Mount trapeze-mounted transformers as indicated.
V. Provide seismic restraints.
W. Provide grounding and bonding per Code.

2.11 ENCLOSED SWITCHES

A. Fusible Switch Assemblies shall be provided in accordance with the following. Description: NEMA KS 1, Type GD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses. Provide NEMA 3R where located outdoors, kitchens or other interior wet areas.
B. Non-fusible switch assemblies shall be provided in accordance with following. Description: NEMA KS 1, Type GD with externally operable handle interlocked to prevent opening front cover with switch in ON position enclosed load interrupter knife switch. Handle lockable in OFF position. Provide NEMA 3R where located outdoors, kitchens or other interior wet areas.
C. Install in accordance with NECA "Standard of Installation". Install fuses in fusible disconnect switches. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

2.12 PANELBOARDS

A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
B. Panelboard Bussing: Bus bars shall be copper. Provide copper ground bus bar in all panelboards.
C. Minimum Integrated Short Circuit Rating: 10,000 amperes RMS symmetrical for 240 volt panelboards; 65,000 amperes RMS symmetrical for 480 volt panelboards, or as indicated.
D. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.
E. Enclosure: NEMA PB 1, Type 1.
F. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 20 inches wide for 480 volt panelboards.
G. Cabinet Front: Flush or Surface cabinet front as scheduled with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard ANSI 49 enamel.

2.13 ENCLOSED CIRCUIT BREAKERS

A. Enclosed Molded Case Circuit Breaker: Comply with NEMA AB 1. Include provisions for padlocking. Provide insulated grounding lug in each enclosure. Provide Products suitable for use as service entrance equipment where so applied. Fabricate enclosure from steel.
B. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions. Install enclosed circuit breakers plumb. Provide supports in accordance with these specifications. Height: 5 ft (1.6 M) to operating handle. Provide engraved plastic nameplates.
C. Inspect each circuit breaker visually. Perform several mechanical ON-OFF operations on each circuit breaker. Verify circuit continuity on each pole in closed position. Determine that circuit breaker will trip on overcurrent condition, with tripping time to NEMA AB 1 requirements. Include description of testing and results in test report.

2.14 FUSES

A. All fuses shall be rated for proper voltage in which they are applied. Interrupting ratings shall be greater than the short circuit current available at the terminals of the switch.
B. Fuse types:
   1. Fuses for branch circuits shall be time delay class J.
   2. Fuses for equipment other than motor loads shall be general fast acting RK-5 or Class J.
   3. Control power transformers for motor controller circuits shall be as recommended by motor starter and motor control center manufacturer.
   4. Fuses for motors shall be sized at 250% of the motor FLA.
   5. Fuses for non-motor loads shall be sized at 125% of the rated FLA of equipment served.

6. Fuses for elevator lifts shall be dual element type and sized in accordance with the elevator manufacturer's recommendations.

C. Spare Fuses
1. Provide spare fuses in the amount of 20% (not less than three (3) nor more than nine (9) of all sizes and types).
2. Spare fuses shall include general purpose fuses, motor fuses, and control fuses used in motor control centers, starters etc.
3. A complete list and quantity of spare fuses shall be submitted with record drawings for review.

2.15 ENCLOSED MOTOR CONTROLLERS

A. The Electrical Contractor shall review the mechanical drawings and coordinate with the Mechanical Contractor for electrical components of the mechanical equipment and systems such as motors, factory mounted motor starters, factory mounted disconnect switches, variable frequency drives and controls to be provided under Division 15 (by the Mechanical Contractor).
B. The Electrical Contractor shall provide motor starters, variable frequency drives and disconnect switches for equipment shown on the drawings where the Mechanical Contractor is not providing such equipment.
C. The electrical contractor shall provide all power wiring for all HVAC equipment.

2.16 ENCLOSED CONTACTORS

A. General purpose contactors: NEMA ICS 2, AC general purpose magnetic contactor. Coil Voltage as indicated. Poles as indicated. Size as indicated. Enclosure per ANSI/NEMA ICS 6, Type as scheduled.
B. Lighting contactors: NEMA ICS 2, magnetic lighting contactor. Coil Voltage as indicated. Poles as indicated. Size as indicated. Contact Rating shall match branch circuit overcurrent protection, considering de-rating for continuous loads.
C. Accessories: Provide Pushbuttons and Selector Switches per NEMA ICS 2, heavy duty type. Provide indicating lights per NEMA ICS 2, push-to-test type. Provide auxiliary contacts per NEMA ICS 2, Class A300 or A600 as required per equipment served.

2.17 INTERIOR LUMINAIRES

A. Lighting fixtures shall be in accordance with identifications as follows:
B. All lamping shall be of the highest quality available.
C. Finishes shall be as selected by the Architect or as indicated on the plans.
D. Any additional appurtenances required for installation and operation, where same are not covered by the identification used on the drawings, shall be included. Lighting fixtures and equipment shall be furnished complete, wired and assembled, including canopies, lamps and other incidental items. Install specified lamps in each luminaire.
E. Recessed fixtures shall be coordinated with ceiling construction by the Electrical Contractor prior to Bid. Refer to the Architect's plans, details and elevations for ceiling types by area. Provide plaster trim kits as required by ceiling construction.
F. Exact location of all fixtures shall be confirmed with Architect prior to rough-in. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
G. Recessed fixtures throughout shall have their components, wiring and external connections coordinated for use in ceilings utilized as air handling plenums. Install recessed luminaires to permit removal from below. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating. Install clips to secure recessed grid-supported luminaires in place
H. Fixtures for use outdoors or in areas designated as damp locations, shall be suitably gasketed and UL listed for such applications.

I. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire
J. Emergency batteries for exterior fixtures shall be remote mounted within the building. Verify maximum distances for remote mounting the emergency batteries with the manufacturer prior to installation. Locate remote emergency batteries above accessible ceilings or utility rooms as required. Provide test switches for all emergency batteries as required.
K. Unless noted otherwise, all fixtures shall be 3500K and have a minimum CRI of 85.
L. The Contractor shall obtain all information relative to the exact type of hung ceilings and suspension systems to be installed before ordering any recessed fixtures. This Contractor shall furnish the proper type fixtures applicable to the ceiling framing system. If, other than the type of fixtures specified are required for installation due to the type of ceiling construction, this Contractor shall furnish and install the proper type fixtures and mounting appurtenances required at no extra charge.
M. The Contractor shall coordinate the exact locations of all lighting fixtures with the ceiling pattern during the construction period and before installation of the fixtures. Interferences between lighting fixtures, and other equipment, shall be brought to the attention of the General Contractor.
N. Include the aiming and/or adjustments of all lighting fixtures requiring same in accordance with instructions issued by the Architect in the field. Aim and adjust luminaries as indicated or as directed by the Owner, Architect or Engineer. Position exit sign directional arrows as indicated. Operate each luminaire after installation and connection. Ensure proper connection and operation.
O. Lighting fixtures shall be supported from building structure only, not from hung or suspended ceiling, by means of chains or threaded rods. The use of tie wire will not be allowed. All fixtures shall include seismic clips and shall be supported to comply with seismic regulations. Install suspended luminaires using pendants supported from swivel hangers or other suitable leveling means. All rows of fixtures shall be level, aligned with building lines and run parallel to each other. Provide pendant length required to suspend luminaires at indicated height. Support luminaires to building structure, independent of ceiling framing.

2.18 FIRE ALARM SYSTEM

A. GENERAL
   1. The contractor shall submit complete documentation for the Fire Alarm/Life Safety System Data Sheets for all items to ensure compliance with these specifications. Copies of this information shall be submitted as required to the Architect award of this work and shall be subject to the approval of the architect.
   2. The contractor shall submit, as part of the complete bid documentation package, certification that the engineered system distributor is a fully authorized factory trained and certified distributor of the system detailed within this specification.
   3. All equipment and material shall be new and unused, and listed by Underwriter's Laboratories for the specific intended purpose. All control panel components, field peripherals and interactive computer peripherals shall be designed for continuous duty operation without degradation of function or performance.
   4. All equipment covered by this specification or noted on installation drawings shall be the best equipment suited for the application and shall be provided by a single manufacturer.
   5. Provide all equipment and accessories and compatible devices for a complete and fully functioning addressable fire alarm system. The fire alarm system shall be coordinated with and inspected by the local fire department, and any inconsistency mentioned during any inspection shall be corrected by contractor at no additional cost to owner.
   6. The control panel shall contain a microprocessor with 10/100 ethernet media access controller (MAC). The system shall be designed specifically for fire detection, and notification applications.
   7. The installing contractor shall coordinate master-box, radio-box, and/or dialer requirements with local fire department.
B. FIRE ALARM LIFE SAFETY SYSTEM SEQUENCE OF OPERATION
   1. Public Mode: The operation of a manual station or activation of any automatic alarm initiating device (system smoke, heat, waterflow) in the common areas of the building, shall automatically:

a. Initiate the transmission of the alarm to the Municipal Fire Station or approved Central Station via the Local Energy or Radio Master-box where required by Code.
b. Sound a code 3 temporal evacuation signal over all audible circuits.
c. Flash all visual signals throughout the building in a synchronized manner.
d. Flash an alarm LED and sound an audible signal at the FACP. Upon acknowledgement, the alarm LED shall light steadily and the audible shall silence. Subsequent alarms shall re-initiate this sequence.
e. Upon alarm initiation by an elevator lobby smoke detector or other designated recall device, recall all elevators that serve the floor of initialization to the main egress level. If the alarm initiates on the main egress level, return the elevator to the alternate floor as directed by the local authority having jurisdiction.
f. Visually indicate the alarm initiating device type and location via the LCD display located at the FACP (and at any remote annunciators) and (illuminate the appropriate alarm zone LED at the remote annunciator).
g. Automatically shut down or control HVAC equipment to initiate smoke control functions as required. Manual override controls and programmable relay interface shall serve as an interface to the Building Automation System.
h. Operate prioritized outputs to release all magnetically held smoke doors and magnetically locked doors throughout the building.
i. Activate the exterior weatherproof beacon.

2. Private mode: The activation of any automatic local alarm initiating device (sounder-base with smoke, or combination smoke/carbon monoxide device) within an apartment shall automatically:
   a. Sound a code 3 temporal evacuation signal for smoke to all alarm devices within the apartment and a code 4 temporal evacuation signal for carbon monoxide to all alarm devices within the apartment.
   b. Visually indicate a supervisory trouble condition of the type and location of the initiating device via the LCD display located at the FACP (and at any remote annunciators) and (illuminate the appropriate zone LED at the remote annunciator).

C. WIRING
1. Provide in accordance with manufacturer's instructions all wiring, conduit and outlet boxes required for the installation of complete system as described herein and as shown on the drawings. Wiring shall be Class A.
2. Installation and fire alarm system wiring shall be installed in metal raceway. An equipment bonding conductor shall be provided in all flexible metallic raceways.
3. Color code for fire alarm systems shall be per the State Fire Alarm code.
4. DC supply to the main fire alarm panel shall be white and black. Fire alarm primary power source shall be on dedicated branch circuit. Circuit breaker locks shall be used. If a separate feed is required for the battery charger it shall be black and white unless the main fire alarm panel required only AC feed. In this case the conductors to the battery charger shall be red and white and shall be on a circuit breaker of fits own.
5. Conductors shall be minimum #14-gauge solid copper type THHN/THWN. Conductor's size shall be increased as required to maintain voltage drop to a maximum of 3%. All AC and DC portions of the system shall be installed in separate raceway. Addressable loop wiring may be #16 providing manufacturer's recommended distance is observed. Systems requiring shielded wiring for addressable loops shall not be acceptable.
6. Red painted terminal cabinets with hinged local covers shall be provided at all junction points. All conductor splices shall be made on screw type terminal blocks, wire nuts shall not be used. All terminals within terminal cabinet shall be properly labeled. Provide terminal cabinet at each building cable entrance and at other locations as required.
7. All fire alarm initiating zone and signal wiring shall be wired Class A.
8. Final connections between the equipment and the wiring system shall be made under the direct supervision of a representative of the manufacturer.
9. Upon completion of the installation of fire alarm equipment, the electrical contractor shall provide to the engineer a signed statement substantially in the form as follows:

a. The undersigned having been engaged as the electrical contractor on this project confirms the fire alarm equipment was installed in accordance with the specifications and in accordance with wiring diagrams, instructions, and directions provided to us by the manufacturer.

D. GUARANTEE AND FINAL TEST
1. All testing (pre-testing, final testing, quarterly testing and program change testing) to be coordinated with the owner and scheduled in advance so that owners and personnel can be present during testing. Contractor to certify that all tests comply with the “State Fire Code”, latest edition.
2. Before this installation shall be considered complete and acceptable to the awarding authorities, a complete test on the system shall be performed as follows:
   a. A pre-test will be held by the electrical contractor with the manufacturer’s authorized representative present. After certification of a complete pre-test, the installing contractor shall inform the authority having jurisdiction of the outcome of the test and will re-inspect in the presence of the authority having jurisdiction and the manufacturer’s authorized representative.
   b. Final test: The electrical contractor in the presence of authorized representative of the manufacturer and the fire department shall operate every manual station, smoke detector, and thermodetector. Each station/detector circuit and horn circuit shall be opened in at least two locations to check for the presence of correct supervisory circuitry. When this testing ahs been completed to the satisfaction of both the electrical contractor’s job foreman and the representative of the manufacturer, a letter from the contractor cosigned by the manufacturer attesting t the satisfactory completion of said testing, shall be forwarded to the owner.
3. The electrical contractor shall guarantee all equipment and wiring to be free from inherent mechanical and electrical defects for a period of one year from the date of final acceptance.
4. The contractor shall provide the Owner with a formal written equipment guarantee upon completion of the installation and testing of the system. The guarantee period shall begin on the day of acceptance of the system by the Owner and shall provide for a period of one year. This guarantee shall be indicated in the manufacturer’s submission prior to approval. This guarantee shall be as normal policy by the equipment manufacturer.
5. The manufacturer shall maintain a full-time service and parts facility, with seven days per week, 24 hour per day service available.
6. All service technicians shall be licensed by the State Fire Code covering service and maintenance of systems.
7. Include as part of the contract, the four quarterly tests following the final acceptance test. Provide quarterly testing in conformance with the State Fire Code latest addition.

2.19 DATA

A. The Electrical Contractor shall provide and install the data outlets and wiring per the Owner’s specifications and direction per data outlet and wiring as shown on the plans. Each data connection shall include the following:
1. Data outlet installed flush in the wall unless otherwise required by the site conditions and approved by the Owner. The outlet shall include faceplate, ID label, inserts, jacks and all other required accessories for a complete installation.
2. Wiring consisting of Category 6, 24AWG, copper cabling installed from outlet to patch panel. All wiring shall be installed concealed in finished & public spaces unless otherwise required by the site conditions and approved by the Owner. shall be used from the outlet to an accessible ceiling. In unfinished or utility spaces, the data cabling shall be installed in EMT conduit where not concealed. Accessible above ceiling installations shall use J-hooks unless cable tray is used. Use plenum rated cable where installed in plenum return spaces per the Mechanical Contractors direction prior to bid.
3. Patch panel and outlet terminations. Provide identification labels at each end of the cable per the Owners requirements. Coordinate with Owner for nomenclature.
4. Test each cable for signal strength per EIA/TIA standards and record all results to be submitted to the Owner. All defective cable and/or termination shall be replaced at no cost to the Owner.

B. Provide patch panel(s) to accommodate each outlet plus 10% spare. Provide rack(s) to accommodate each patch panel.
C. Servers, switches, routers and active electronic equipment by Owner.

2.20 TELEPHONE

A. The Electrical Contractor shall provide and install the telephone outlets and wiring per the Owner's specifications and directions as shown on the plans. Each telephone connection shall include the following:
   1. Telephone outlet installed flush in the wall unless otherwise required by the site conditions and approved by the Owner. The outlet shall include faceplate, ID label, inserts, jacks and all other required accessories for a complete installation.
   2. Wiring consisting of Category 6, 24AWG, copper cabling installed from outlet to patch panel. All wiring shall be installed concealed in finished & public spaces unless otherwise required by the site conditions and approved by the Owner. shall be used from the outlet to an accessible ceiling. In unfinished or utility spaces, the data cabling shall be installed in EMT conduit where not concealed. Accessible above ceiling installations shall use J-hooks unless cable tray is used. Use plenum rated cable where installed in plenum return spaces per the Mechanical Contractors direction prior to bid.
   3. Telephone terminal board or PBX (private branch exchange) equipment and outlet terminations. Provide identification labels at each end of the cable per the Owners requirements. Coordinate with Owner for nomenclature.
   4. Test each cable for signal strength per EIA/TIA standards and record all results to be submitted to the Owner. All defective cable and/or termination shall be replaced at no cost to the Owner.
B. PBX (private branch exchange) equipment by Owner.

PART 3 – EXECUTION

3.1 BASIC REQUIREMENTS

A. Adhere to best industry practice and the following:
   1. All work shall be concealed.
   2. Route circuitry runs embedded in concrete to coordinate with structural requirements.
   3. Equip each raceway intended for the future installation of wire or cable with a nylon pulling cord 3/16" in diameter and clearly identify both ends of the raceway.
   4. Provide all outlet boxes, junction boxes, and pull boxes for proper wire pulling and device installation. Include those omitted from the drawings due to symbolic methods of notation.
   5. Utilize lugs of the limited type to make connections at both ends of cables installed on the line side of main service overcurrent and switching devices. Provide cable limiters for each end of each service entrance cable.
   6. Beyond the termination of raceways, fireproof the following:
      a. All wires and cables within pad-mounted transformer enclosure.
      b. All service feeder cables ahead of main service overcurrent protection devices, and elsewhere where not in raceways.
   7. Fireproofing of wires and cables shall be by means of a half-lapped layer of arcproof or by means of sleeving of a type specifically manufactured for the purpose. Ends of tape or sleeving shall be severed with twine. Fireproofing shall be extended up into raceways. After conductors have been finally shaped into their permanent configuration, fireproofing tape or sleeving shall be coated with silicate of soda (water glass). Fireproofing shall be applied in an overall manner to raceway groupings of conductors.
   8. Provide all sleeves through fireproof and waterproof slabs, walls, etc., required for electric work.
   9. Provide waterproof sealing for the sleeves through waterproof slabs, walls, etc.
   10. Provide fireproof sealing for the sleeves through fireproof walls, slabs, etc.

11. Provide fireproof sealing for the openings in fireproof walls, slabs, etc., resulting from removal of existing electrical sleeves, conduits, poke-thru's etc.
12. No splicing of wires will be permitted in the Fire Alarm System.
13. Bundle wiring passing through pull boxes and panelboards in a neat and orderly manner with plastic cable ties. Cable ties shall be by Ty-Raps as manufactured by Thomas & Betts, Holub Industries Inc., Quick Wrap, Bundy Unirap, or equal.
14. Turn branch circuits and auxiliary system wiring out of wiring gutters at 90 degrees to circuit breakers and terminal lugs.

3.2 TESTING REQUIREMENTS & INSTRUCTIONS

A. Where any repairs, modifications, adjustments, tests or checks are to be made, the Contractor shall contact the Engineer to determine if the work should be performed by or with the Manufacturer's Representative.
B. Tests are to:
   1. Provide initial equipment/system acceptance.
   2. Provide recorded data for future routine maintenance and trouble-shooting.
   3. Provide assurance that each system component is installed satisfactorily and can be expected to perform, and continue to perform its specified function with reasonable reliability throughout the life of the facility.
C. At any stage of construction and when observed, any electrical equipment or system determined to be damaged, or faulty, is to be reported to the Engineer. Corrective action by the Contractor requires prior Engineer approval, retesting, and inspection.
D. When the electrical tests and inspections specified or required within Division 16 are completed and results reported, reviewed, and approved by the Engineer, the Contractor may consider that portion of the electrical equipment system or installation electrically complete. The Contractor will then affix appropriate, approved, and dated completion or calibration labels to the tested equipment and notify the Engineer of electrical completion. If the Engineer finds completed work unacceptable, he will notify the Contractor in writing of the unfinished or deficient work, with the reason for his rejection, to be corrected by the Contractor. The Contractor will notify the Engineer in writing when exceptions have been corrected. The Contractor will prepare a "Notification or Substantial Electrical Completion" for approval by the Engineer following Engineer's acceptance of electrical completion. If later in-service operation or further testing identified problems attributable to the Contractor, these will be corrected by the Contractor, at no additional cost to the Authority.
E. Grounding Systems:
   1. Test main building loops and major equipment grounds to remote earth, directly referenced to an extremely low resistance (approximately 1 ohm) reference ground benchmark. Perform a visual inspection of the systems, raceway and equipment grounds to determine the adequacy and integrity of the grounding. Ground testing results shall be recorded, witnesses, and submitted to the Engineer.
   2. Perform ground tests using a low resistance, null-balance type ground testing ohmmeter, with test lead resistance compensated for. Use the type of test instrument which compensates for potential and current rod resistances.
   3. Test each ground rod and measure ground resistance. If resistance is not 10 ohms or less, drive additional rods to obtain a resistance of 10 ohms or less. Submit tabulation of results to Engineer. Include identification of electrode, date of reading and ground resistance valve in the test reports.
   4. Test each building and major equipment grounding system for continuity of connections and for resistance. Ground resistance of conduits, equipment cases, and supporting frames, shall not exceed 5 ohms to ground. Submit all readings to the Engineer.
   5. Where ground test results identify the need for additional grounding conductors or rods that are not indicated or specified, design changes will be initiated to obtain the acceptable values. The Contractor is responsible for the proper installation of the grounding indicated and specified.

6. Operating Instructions: Furnish operating instructions to Owner's designated representative with respect to operations, functions and maintenance procedures for equipment and systems installed. Cost of such instruction up to a full five (5) days of Electrical Subcontractor's time shall be included in contract. Cost of providing a Manufacturer's Representative at site for instructional purposes shall also be included.

3.3 BRANCH CIRCUITRY

A. For all lighting and appliance branch circuitry, raceway sizes shall conform to industry standard maximum permissible occupancy requirements except where these are exceeded by other requirements specified elsewhere.
B. Circuits shall be balanced on phases at their supply as evenly as possible.
C. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.
D. Reduced size conductors indicated for any feeders shall be taken as their grounding conductors.
E. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one (1) cable for each leg and one (1) neutral cable, if any.
F. For circuitry indicated as being protected at 20 Amps or less, abide by the following:
   1. All 20 amp, 120/208 volt, 3-phase, 4-wire combined branch circuit homeruns shall be provided with a #8 AWG neutral conductor.
   2. Minimum conductor size shall be No. 12 AWG cooper.
   3. Conductors operating at 120 volts extending in excess of 100 ft. or at 277 volts extending in excess of 200 ft., or the last outlet or fixture tap shall be No. 10 AWG cooper throughout.
   4. Lighting fixtures and receptacles shall not be connected to the same circuit.
G. Type MC Cable Installation:
   1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:
      a. Cable shall be supported in accordance with code. Tie wire is not an acceptable means of support. Cable supports such as Caddy WMX-6, MX-3, and clamps such as Caddy 449 shall be used. Where cables are supported by the structure and only need securing in place, then ty-raps will be acceptable. Ty-raps are not acceptable as a means of support. All fittings, hangers, and clamps for support and termination of cables shall be of type specifically designed for use with cable, i.e., romex connectors not acceptable.
      b. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek Co.; not with a hacksaw.
      c. Use split "Insuliner" sleeves at terminations.

3.4 REQUIREMENTS GOVERNING ELECTRICAL WORK IN DAMP OR WET LOCATIONS

A. Outlets and outlet size boxes shall be of galvanized cast ferrous metal only.
B. The finish of threaded steel conduit shall be galvanized only.
C. Wires for pulling into raceways for lighting and appliance branch circuitry shall be limited to "THWN".
D. Wires for pulling into raceways for feeders shall be limited to "THWN".
E. Plates for toggle switches and receptacles shall have gasketed snap shut covers suitable for wet locations while in use.
F. Final connections of flexible conduit shall be neoprene sheathed.
G. Apply one (1) layer of half looped plastic electric insulating tape over wire nuts used for joining the conductors of wires.
H. Enclosures, junction boxes, pull boxes, cabinets, cabinet trims, wiring troughs and the like, shall be fabricated of galvanized sheet metal, shall conform to the following:
   1. They shall be constructed with continuously welded joints and seams.
   2. Their edges and weld spots shall be factory treated with cold galvanizing compound.
   3. Their connection to circuitry shall be by means of watertight hub connectors with sealing rings.

I. Enclosures for individually mounted switching and overcurrent devices shall be NEMA Class IV weatherproof construction.
J. The covers, doors and plates and trims used in conjunction with all enclosures, pull boxes, outlet boxes, junction boxes, cabinets and the like shall be equipped with gaskets.
K. Panels shall be equipped with doors without exception.
L. The following shall be interpreted as damp or wet locations within building confines:
   1. Spaces where any designations indicating weatherproof (WP) or vapor proof appear on the drawings.
   2. Below waterproofing in slabs applied directly on grade.
   3. Spaces defined as wet or damp locations by Article 100 of the National Electric Code.
   4. Parking garage.

3.5 REQUIREMENTS GOVERNING ELECTRIC WORK IN AIR HANDLING SPACES

A. Within air handling ductwork or plenums (other than spaces within suspended ceilings used for air handling purposes), Area “B” and the media shall comply with requirements for return air plenums.
B. Abide by the requirements specified for electric work in damp locations within building confines.
C. Where circuitry passes through duct walls, include, in accordance with instructions issued in the field, airtight sealing provisions which allow for a relative movement between the circuitry and the duct walls.
D. Exclude the installation of type NM or NMC cable.
E. In spaces within suspended ceilings used for air handling purposes, abide by the requirements specified for normal electric work conditions except:
F. Lighting fixtures recessed into the ceilings shall be certified as being suitable for this purpose.

3.6 LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION

A. Perform the following work, in accordance with field instructions issued by the Architect to assure that minimal noise is produced by electrical installations due to equipment furnished as part of the electrical work.
B. Check and tighten the fastenings of sheet metal plates, covers, doors and trims used in the enclosures of electrical equipment.
C. Remove and replace any individual device containing one or more magnetic flux path metallic cores (e.g., discharge lamp ballast, transformer, reactor, dimmer, and solenoid) which is found to have a noise output exceeding that of other identical devices installed at the project.

3.7 SUPPORTS AND FASTENINGS

A. Support work in accordance with best industry standards, and Local Electric Code.
B. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free standing position.
C. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braces to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.
D. No work intended for exposed installation shall be mounted directly on any building surface. In such locations, flat bar members or spaces shall be used to create a minimum of ¼” air space between the building surfaces and the work. Provide ¾” thick exterior grade plywood painted with two (2) coats of fire-retardant gray paint for mounting of panelboards.
E. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways or cables for support.
F. Nothing shall rest on, or depend for support on, suspended ceiling media.
G. Support less than 2” trade size, vertically run, conduits at intervals no greater than 8’. Support such conduits, 2-1/2” trade size or larger, at intervals no greater than they story height, or 15’, whichever is smaller.

H. Where they are not embedded in concrete, support less than 1" trade size, horizontally run, conduits at intervals no greater than 7'. Support such conduits, 1" trade size or larger, at intervals no greater than 10'.
I. Support all lighting fixtures directly from structural slab, deck or framing member.
J. Where fixtures and ceilings are such as to require fixture support from ceiling openings frames, include in the electric work the members necessary to tie back the ceiling opening frames to ceiling suspension members or slabs so as to provide actual support for the fixtures noted above.
K. As a minimum procedure, in suspended ceilings support smalls runs of circuitry (e.g., conduit not in excess of 1" trade size) from ceiling suspension members as defined above. Support larger runs of circuitry directly from structural slabs, decks or framing members.
L. Fasten electric work to building structure in accordance with the best industry practice.
M. Floor mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastenings in all cases.
N. For items which are shown as being ceiling mounted at locations where fastenings to the building construction element above is not possible, provide suitably auxiliary channel or angle iron bridging tying to building structural elements.
O. As a minimum procedure, where weight applied to the attachment points is 100 lbs. or less, fasten to concrete and solid masonry with bolts and expansion shields.
P. As a minimum procedure, where weight applied to building attachment points exceed 100 lbs., but is 300 lbs. or less, conform to the following:
    1. At field poured concrete slabs, utilize inserts with 20' minimum length slip-through steel rods, set transverse to reinforcing steel.

3.8 SPLICING AND TERMINATING WIRES AND CABLES

A. Maintain all splices and joints in removable cover boxes or cabinets where they may be easily inspected.
B. Locate each completed conductor splice or joint in the outlet box, junction box, or pull box containing it, so that it is accessible from the removal cover side of the box.
C. Join solid conductors No. 8 AWG and smaller by securely twisting them together and soldering, or by using insulated coiled steel spring "wire nut" type connectors. Exclude "wire nuts" employing non-expandable springs. Terminate conductors No. 8 AWG and smaller by means of a neat and fast holding application of the conductors directly to the binding screws or terminals of the equipment or devices to be connected.
D. Join, tap and terminate standard conductors No. 6 AWG and larger by means of solder sleeves, taps, and lugs with applied solder or by means of bolted saddle type or pressure indent type connectors, taps and lugs. Exclude connectors and lugs of the types which apply set screws directly to conductors. Where equipment or devices are equipped with set screw type terminals which are impossible to change, replace the factory supplied set screws with a type having a ball bearing tip. Apply pressure indent type connectors, taps and lugs utilizing tools manufactured specifically for the purpose and having features preventing their release until the full pressure has been exerted on the lug or connector.
E. Except where wire nuts are used, build up insulation over conductor joints to a value, equal both in thickness and dielectric strength, to that of the factory applied conductor insulation. Insulation of conductor taps and joints shall be by means of half-lapped layers of rubber tape, with an outer layer of friction tape; by means of half-lapped layers of approved plastic electric insulating tape; or by a means of split insulating casings manufactured specifically to insulate the particular connector and conductor, and fastened with stainless steel or non-metallic snaps or clips.

3.9 PULLING WIRES INTO CONDUITS AND RACEWAYS

A. Delay pulling wires or cables in until the project has progressed to a point when general construction procedures are not liable to injure wires and cables, and when moisture is excluded from raceways.

B. Utilize nylon snakes or metallic fish tapes with ball type heads to set up for pulling. In raceways 2" trade size and larger, utilize a pulling assembly ahead of wires consisting of a suitable brush followed by a 3-1/2" diameter ball mandrel.
C. Leave sufficient slack on all runs of wire and cable to permit the secure connection of devices and equipment.
D. Include circular wedge-type cable supports for wires and cables at the top of any vertical raceway longer than 20 feet. Also include additional supports spaced at intervals which are no greater than 10'. Supports shall be located in accessible pull boxes. Supports shall be of a non-deteriorating insulating material manufactured specifically for the purpose.
E. Pulling lubricants shall be used. They shall be products manufactured specifically for the purpose.

3.10 REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET BOXES AND PULL BOXES

A. Flush wall-mounted outlet boxes shall not be set back to back but shall be offset at least 12" horizontally regardless of any indication on the drawings.
B. Locate all boxes so that their removable covers are accessible without necessitating the removal of parts of permanent building structure, including piping, ductwork, and other permanent mechanical elements.
C. In conjunction with concealed circuitry, abide by one of the following instructions (as may be applicable to the conditions) in order to assure the aforementioned accessibility. (Not required for circuitry concealed by removable suspended ceiling tiles.)
D. For a small (outlet size) box on circuitry concealed in a partition or wall, locate box or fitting so that its removable cover side, (or the face of any applied raised cover) penetrates through to within 1/8" of the exposed surface of the building materials concealing the circuitry and apply a blank or device plate to suit the functional requirements.
E. For a large box on circuitry concealed in a partition, suspended ceiling, or wall, locate box totally hidden but with its removable cover directly behind an architectural access door or panel (included for the purpose, separate from the electric work) in the building construction which conceals the circuitry.
F. Include all required junction and pull boxes regardless of indications on the drawings (which, due to symbolic methods of notation, may omit to show some of them).
G. Unless noted below or otherwise specifically indicated, include a separate outlet box for each individual wiring device, lighting fixture and signal or communication system outlet component. Outlet boxes supplied attached to lighting fixtures shall not be used as replacements for the boxes specified herein.
H. Utilize an outlet box no smaller than 5" square by 2-1/2" deep.
I. Allow no fixture to be supplied from an outlet box in another room.
J. Multiple local switches indicated at a single location shall be gang-mounted in a single outlet box.
K. Install junction boxes, pull boxes and outlet boxes in conjunction with concealed circuitry.
L. Close up all unused circuitry openings in outlet boxes. Unused openings in cast boxes shall be closed with approved cast metal threaded plugs. Unused openings in sheet metal boxes shall be closed with sheet metal knock-out plugs.
M. Outlet boxes for switches shall be located at the strike side of doors. Indicate door swings are subject to field change. Outlet boxes shall be located on the basis of final door swing arrangements.
N. Boxes and plaster covers for duplex receptacles shall be arranged for vertical mounting of the receptacle.
O. Equip outlet boxes used for devices which are connected to wires of systems supplied by more than one set of voltage characteristics with barriers to separate the different systems.
P. Barriers in junction and pull boxes of outlet size shall be of the same metal as the box.
Q. Barriers in junction and pull boxes which are larger than outlet size shall be of the polyester resin fiberglass of adequate thickness for mechanical strength, but in no case less than 1/4" thick. Each barrier shall be mounted, without fastenings, between angle iron guides so that they may be readily removed.

3.11 LOCATING AND ROUTING OF CIRCUITRY

A. In general, all circuitry shall be run concealed except that it shall be run exposed where the following conditions occur:
   1. Horizontally at the ceiling of permanently unfinished spaces which are not assigned to mechanical or electrical equipment.
   2. Horizontally and vertically in mechanical equipment spaces.
   3. Horizontally and vertically in electric equipment rooms.
B. Concealed circuitry shall be so located that building construction materials can be applied over its thickest elements without being subject to spalling or cracking.
C. All circuitry and raceways shall not be run within slabs. If field conditions requires raceways to be embedded in field-poured structural building construction concrete fill or slab shall conform to the following:
   1. Where turned up or down into a wall or partition they shall, before entering same, be routed parallel for a long enough distance to assure that no relocation of the wall or partition will be necessary to conceal the required bend.
   2. They shall be routed in such a manner as to coordinate with the structural requirements of the building.
   3. They shall be routed in accordance with field instructions issued by the Architect where such instructions differ from specifications set forth herein.
D. Circuitry run exposed shall be routed parallel to building walls and column lines.
E. Circuitry shall be routed so as to prevent electric conductors from being subject to high ambient temperature. Minimum clearances from heated lines or surfaces shall be maintained as follows:
   1. Crossing where uninsulated: 3”.
   2. Crossing where insulated: 1”
   3. Running parallel where uninsulated: 36”.
   4. Running parallel where insulated: 6”.
F. Circuitry shall not be run in elevator shafts, hoistways, and the like. Where outlets for trail cables, pit lights, run be level lights, and the like, are involved, only the “final connection” outlet boxes themselves shall be located within or open into, the confines of the shaft.

3.12 INSTALLING CIRCUITRY

A. The outside surface of circuitry, which is to be embedded in cinder concrete, shall be coated with asphaltum paint.
B. In runs of conduit or raceway including flexible limit the number of bends between cable access points to a total which does not exceed the maximum specified for the particular system. Where no such maximum is specified, limit the number to four (4) right angle bends or the equivalent thereof.
C. In each conduit or raceway assigned for the future pulling in of wires, include a nylon drag cord. In raceways 2” trade size and larger, the cord shall be pulled in utilizing a suitable brush, followed by an 85% diameter ball mandrel ahead of the cord in the pulling assembly. In the event that obstructions are encountered, which will not permit the drag cord to be installed, the blocked section of raceway shall be replaced and any cutting and patching of the structure involved in such replacement shall be included as part of the electric work.
D. Circuitry shall be arranged such that conductors of one feeder or circuitry carrying “going” current are not separated from conductors of the same feeder or circuitry carrying “return” current by any ferrous or other metal. Where not within raceways, all “going” and “return” current conductors of one feeder or circuit shall be laced together so as to minimize induction heating of adjacent metal components.
E. Sleeves used where circuitry is to penetrate waterproof slabs, decks and walls, shall be of a type selected to suit the water condition encountered in the field.

END OF SECTION

SECTION 22 00 00 –PLUMBING

PART I -- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

B. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 DEFINITIONS

A. As used in this section, “provide” means “furnish and install”, and “POS” means “Provided under Other Sections”.

B. As used in the drawings and specifications for plumbing work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the plumbing work.

C. "Approved Equal" means any equipment or material, which is approved by the engineer, and equal in quality, durability, appearance, strength, design and performance to the equipment or material originally specified.

D. "Concealed" means hidden, in chases, furred spaces, walls, above ceilings or enclosed in construction.

E. "Contractor and/or Subcontractor" specifically means, the Plumbing Subcontractor working under this Section of the Specification.

F. "Exposed" means visible, in sight, or not installed "concealed" as defined above.

G. “Furnish” or “Provide” means:

1. Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the plumbing work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.

2. To supply, erect, install and connect in complete readiness for operation, the particular work referred to, unless otherwise specified.

H. “Install” means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the plumbing work.

I. “New” means: Manufactured within the past two (2) years and never before used.

J. "Piping" means all piping including fittings, joints, hangers, supports and valves.

K. “Provide” means: “Furnish” and “Install”.

L. "Underground" means piping that is buried exterior to or within the building.

M. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any plumbing item in the drawings or specifications for plumbing work carries with it the instruction to furnish, install and connect the item as part of the plumbing work, regardless of whether or not this instruction is explicitly stated.

N. It shall be understood that the specifications and drawings for plumbing work are complimentary and are to be taken together for a complete interpretation of the plumbing work except that indications on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

1.3 SUMMARY

A. This section addresses materials and methods common to more than one Subcontractor. Refer to the drawings to determine the extent of work required of each individual trade.

1.4 DESCRIPTION OF WORK

A. The building plumbing fixtures will meet the requirements of the American with Disabilities Act (ADA) and the federal Fair Housing Act and Uniform Federal accessibility Standards (UFAS).

B. The work described herein shall be interpreted as work to be done by the Plumbing Subcontractor. Work to be performed by other trades will be specifically referenced to a particular Contractor or Subcontractor.

C. The work under this section shall consist of furnishing all labor, materials, equipment, supervision, transportation, construction, facilities, devices and incidentals necessary to provide complete plumbing systems as hereinafter described and as indicated on the drawings, including, but not limited to the following:

1. Domestic Cold & Hot Water distribution systems:
    a. Provide domestic water for all plumbing fixtures, equipment, and all other systems, equipment, and devices that require domestic water supply.
    b. Building domestic water distribution systems shall be metered and isolated from the municipal water supply in accordance with the municipality's requirements.
    c. The design of building supply and distribution systems shall provide a volume of water at the required flows, pressures and temperatures to ensure safe, efficient and code compliant operation during periods of peak demand.
    d. Interior cold water piping shall be insulated to prevent condensation. Interior hot water piping shall be insulated as required by Code.
    e. Provide a minimum of two exterior freeze proof wall hydrants.
2. Domestic Hot Water:
    a. Dwelling Units: Each dwelling units domestic hot water shall be generated by a hybrid electric air source heat pump water heater sized appropriately to handle the hot water demand. Provide and install all necessary fittings, pipes and connections. Water will be stored at a temperature of 140°F and mixed down to 120°F for domestic use. Each system shall include a thermostatic mixing valve assembly for the 120°F hot water system.
    b. Management Office: Hot water shall be generated by a bank of hybrid electric air source heat pump water heater sized appropriately to handle the hot water demand for the laundry and bathroom. Provide and install all necessary fittings, pipes and connections. Water will be stored at a temperature of 140°F and mixed down to 120°F for domestic use. Each system shall include a thermostatic mixing valve assembly for the 120°F hot water system.
    c. Maintenance Garage: Hot water for the hand sink shall be generated by an instantaneous electric water heater. Discharge shall be set for 120°F.

3. Domestic Hot Water Re-circulation (if required):
    a. Pumps shall be all bronze, centrifugal type, close coupled, with side suction as manufactured by Bell and Gossett Company, Taco Heaters, Incorporated, Thrush or approved equal. Pump shall be in line type with valved bypass. Motor shall be single phase, 60 hertz AC.

b. Pump shall be provided with a manual motor starting switch. Pump operation shall be controlled by an immersion type aquastat set to start pump and stop pump at selected settings. This Contractor shall provide all control wiring.
c. Recirculating pump, taco 009. Non-ferrous baffle, bronze casing, non-metallic impeller, ceramic shaft, 125 psi pressure rating, 230 degree max. Temp. Rating, 1/2hp @ 3250 rpm, 20 amp rating, 115v, 60hz, 1 phase. 2 gpm @ 20' head.

4. Sanitary Waste & Vent Systems:
   a. Provide sanitary waste and vent systems for all plumbing fixtures, floor drains, equipment, and all other domestic waste producing equipment, and devices that are required by Code to discharge into the sanitary sewer.
   b. Waste and vent systems shall be designed using fixture drain loads established by Code and provide proper operation during periods of peak demand.
   c. All new waste lines shall be tested to insure proper operation of all new waste systems.
   d. Install floor drains and drip pans in all laundry rooms and at water service entrance. All floor drains to have trap primer units and piped cold water..

1.5 CODES, ORDINANCES AND PERMITS

A. All materials and workmanship shall comply with the latest editions of all applicable Codes, Local and State Ordinances, Industry Standards and Regulations.

B. Where the contract documents indicate more stringent requirements than the following codes and ordinances, the contract documents shall take precedence.

C. In the event of a conflict with Codes, the most stringent requirements shall apply.

D. The Plumbing Subcontractor shall notify the Architect/Engineer of any discrepancies between the Contract Documents and applicable Codes, Standards, etc.

E. File all documents, pay all fees and secure all permits, inspections and approvals necessary for the work of this section.

F. The following Codes, Standards and References shall be utilized as applicable:

1. Rhode Island Fuel Gas & Plumbing Code
2. Regulations of the governing Water & Sewer Department
3. State and Local Building Code.
4. Local Codes, Ordinances, Board of Health requirements and Regulations of the town of East Providence, RI.
5. Americans with Disabilities Act (ADA).
6. American National Standards Institute (ANSI).
7. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
8. American Society of Mechanical Engineers (ASME).
9. American Society of Testing Materials (ASTM).
10. American Welding Society (AWS).
11. Commercial Standards, U.S. Department of Commerce (CS).
12. Department of Environmental Protection (DEP).
13. Environmental Protection Agency (EPA).

14. Factory Mutual (FM).
15. Industrial Risk Insurers (IRI).
16. Insurance Services Organization (ISO).
17. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS).
18. National Electric Code (NEC).
19. National Electrical Manufacturers Association (NEMA).
20. National Fire Protection Association (NFPA).
21. Occupational Safety and Health Administration (OSHA)
22. State Department of Public Safety.
23. Underwriters' Laboratories, Inc. (UL).
24. International Residential Code
25. International Energy Conservation Code
26. Attached Reference Materials

1.7 SHOP DRAWINGS AND PRODUCT DATA

A. SUBMITTALS: Submit shop drawings, manufacturers data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication, or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable industry, and technical society publication references, and other information necessary to establish contract compliance of each item the Contractor propose to furnish.

B. Submit in accordance with Division 1.

C. It is the intent of these specifications that all equipment, materials and workmanship used on this project be in complete conformance with all local, state and national codes, ordinances and standards.

D. Substitutions shall conform to the intent stated in above. It is the contractor's responsibility to submit only those items that meet these codes. Should any non-conformance code items be installed, they shall be replaced by the contractor at no additional cost to the owner.

E. The approval of the equipment does not relieve the Subcontractor of responsibility of shop drawing errors related to details, sizes, quantities, wiring diagram arrangements and dimensions which deviate from the Specifications, and/or job conditions as they exist.

F. Refer to General Requirements for the substitutions of equipment and submittal of shop drawings. If apparatus or materials are substituted for those specified, and such substitution necessitates changes in, or additional connections, piping, supports, or construction, it shall be provided. Contractor to assume cost and entire responsibility thereof.

1.8 INSPECTION AND TESTS

A. During the progress of the work it shall be subject to the inspection of the Owner and to such other inspectors, as may have jurisdiction.

B. A final inspection of the installation to determine compliance with the drawing and specifications will be made by the Owner's representative. Work will be checked for quality of

materials, quality of workmanship, proper installation and finished appearance. This Contractor shall provide the services of the project foreman for inspection purposes. The foreman shall remove and reinstall access panels, ceiling tiles, etc., as required to facilitate any inspections required by the Owner's representative.

C. The Contractor shall arrange and conduct operating tests on all equipment. The component parts of systems and the various systems shall be demonstrated to operate in accordance with the requirements and intent of this specification. Any non-complying or defective materials or workmanship disclosed as a result of the inspection and the Contractor shall correct tests promptly.

1.9 RECORD DRAWINGS

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

B. At completion of work prepare a complete set of Record Drawings showing all systems as actually installed. The quantity of design tracings which are made available shall in no way be interpreted as setting a limit to the number of drawings necessary to show the required information. The Plumbing Contractor’s professional draftsperson shall transfer changes and submit three (3) sets of prints to Architect for comments as to compliance with this section.

C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Plumbing Contractor.

D. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

E. All costs related to these requirements shall be paid for by this Subcontractor.

1.10 MAINTENANCE MANUALS

A. Maintenance Manuals: At the completion of the project, turn over to the General Contractor four (4) complete manuals in 3-ring binders, indexed, containing the following:
   1. Complete shop drawings of all material and equipment in Part 2 of this section.
   2. Operation descriptions of all systems.
   3. Names, addresses and telephone numbers of all suppliers of system components.
   4. Preventative maintenance instructions for all systems.
   5. Spare parts list of all system components.
   6. Copies of all valve charts.

1.11 GUARANTEE

A. This Contractor shall obtain in the General Contractor's and Owner's name, the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities which the Contractor

may have by law or other provisions of the Contract Documents. The guarantee shall be for a period of one (1) year minimum from the date of acceptance or final payment.

1.12 STORAGE OF MATERIALS

A. Store materials prior to their installation where designated by the General Contractor. This Contractor shall be responsible for all materials stored and protect all installed equipment from injury or defacement.

1.13 DESIGN BUILD PROVISIONS

A. The Work will be performed based on a Design/Build approach in which the Plumbing Subcontractor provides the engineering needed to satisfy performance criteria and other requirements listed herein. The criteria and requirements are meant to establish the general intent and do not always give specific sizes and types. This proposal must therefore include both system design and engineering services.

B. Shop Drawings shall clearly describe the limits of the Work and identify related work by other trades. Work that the Plumbing Subcontractor requires to be done by other trades should also be noted. Formal coordination drawings will not be produced. Instead each major subcontractor will circulate their drawings to the other trades for review and comments. This will conclude with a coordination meeting in which all conflicts will be identified and resolved.

C. The responsibility to insure that all Work items fit in the space available lies with the Plumbing Subcontractor. The Shop Drawings must in turn include dimensioned details drawn to scale.

D. The Plumbing Subcontractor shall revise the Shop Drawings to include all required changes. Final revised drawings shall be issued prior to starting work.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Pipe and fittings shall be of US manufacture, and shall conform to the latest ASA, ASTM and/or FS Standards.

B. Type A: Type L hard drawn copper tubing with wrought copper sweat fittings joined with approved 95/5 lead free tin antimony solder.

C. Type B: Schedule 40 PVC pipe with ASTM D2665 solvent weld joints and ASTM D2564 solvent cement.

D. Pipe and fittings shall be in accordance with the following:

1. Cold Water	Type A
2. Hot Water Supply	Type A
3. Sanitary, Waste and Vent	Type B
4. Water Heater Relief Valve Discharge	Type A

E. Provide PEX piping thru floor joists wherever possible.

2.2 WATER METER AND BACKFLOW PREVENTOR

A. The building shall have one (1) domestic water meter approved by the governing water department with backflow preventer at the entrance of the domestic water service into the building with the following:

1. Meter shall be approved equal with one-piece bronze case, bronze measuring chamber and ASME flanges to match incoming line size.

2. Meter shall conform with all rules and regulations of all Authorities having jurisdiction and shall comply with the latest Standards of American and New England Water Works Association, obtain approval of the Local Water Department prior to ordering or installation of meters.

3. The meter shall be the remote reading type and shall conform with all rules and regulations of all Authorities having jurisdiction. Obtain approval of the Local Water Department prior to ordering or installation of remote read device. Remote read device shall be mounted in an acceptable location as determined by the Local Water Department.

2.3 VALVES

A. Shut-off valves on cold water and hot water piping 1/2 inch shall be Apollo Series 70-200, solder end, bronze body ball valve, chrome plated bronze ball, 600 psi WOG.

B. Install main accessible shut-off valves for each Suite for water lines.

C. Washing machine shut-off valves shall be equal to Watts series A2C-M1 “Intelliflow” automatic shut-off valve.

D. Shut-off valves on cold water, hot water and hot water recirculation water piping shall be Apollo Series 77-200, solder end, bronze body ball valve, chrome plated bronze ball, 600 psi WOG, full port ball valve.

E. Check valves on cold water, hot water and hot water recirculation piping shall be Nibco Figure No. S-413-W, solder end, bronze body swing check, bronze disc, 200 psi WOG.

F. Drain valves shall be 1/2 inch Apollo Model 78-103 with Watts No. 8A hose connection vacuum breaker, cap with chain of length as required.

G. All ball valves for installation in insulated piping shall have valve extensions to suit installation thickness.

2.4 HANGERS AND SUPPORTS

A. Pipe hangers, pipe anchors, auxiliary steel, wood blocking and fixture supports shall be furnished and set by this Contractor, and he shall be responsible for their proper and permanent location. This Contractor shall be responsible for all core drilling.

B. All piping shall be rigidly supported from the building structure by means of approved hangers and supports. The hanging and support of all piping system shall conform to the ANSI/MSS-SP.58 AND MSS-SP 69 latest edition. This Contractor shall furnish and install all required auxiliary steel required for hanging of piping.

C. All horizontal piping shall be hung with approved adjustable malleable iron pipe hangers. Hangers shall be provided at each joint and at each horizontal branch connection. Hangers shall be adequate to maintain alignment, prevent sagging and shall be placed on or immediately adjacent to the coupling. Horizontal piping shall be braced against

horizontal movement with sway bracing. Supports shall be placed directly beneath horizontal fittings that connect to the stack. Copper tubing 1-1/2 inch and larger shall be supported at ten (10) foot intervals. Copper tubing 1-1/4 inch and smaller shall be supported at six (6) foot intervals. Steel piping shall be supported at six (6) foot intervals for piping 1/2 inch and smaller, at eight (8) foot intervals for 3/4 inch and one inch piping and at ten (10) foot intervals for piping 1-1/4 inch and larger. Plastic piping shall be supported at 4-1/2 foot intervals for 1-1/2 inch piping, at five (5) foot intervals for two inch piping and six (6) foot intervals for piping three inch and larger.

D. All fixtures and equipment shall be supported and fastened in a satisfactory manner and in accordance with fixture manufacturer's recommendations.

E. Wherever wood blocking is required to insure adequate support of fixtures and related piping, it shall be provided by this Contractor and it shall be fire treated.

H. All inserts in new concrete construction shall be capable of developing the full strength of the rod or bolt used in them and shall be either continuous insert type or malleable iron concrete inserts for rod sizes 3/8 inch to 7/8 inch. Continuous inserts shall have anchors every 4 inches and shall extend 1-1/2 inches above the back of the insert and shall hook to provide anchor. All inserts shall be tied to the reinforcing steel rods with wire and properly sized reinforcing rods shall be inserted through the special holes, hooks or brackets provided in or on the inserts to securely anchor insert to the structure.

2.5 SLEEVES, ESCUTCHEONS AND FIRESTOPPING

A. Sleeves shall be furnished and set by this Contractor and he shall be responsible for their proper and permanent location. This Contractor shall be responsible for all core drilling. Core openings shall have link-seal fire-rated penetration closures.

B. This Contractor shall provide steel sleeves at all points where pipes and all other work under his charge pass through masonry, concrete or wood. Sleeves shall have flanges or wings at mind-points to prevent sleeve from slipping through the floor or wall. Pipe sleeves shall be sufficient diameter to provide approximately 1/4 inch clearance around the pipe or the insulation on insulated systems. Sleeves through walls shall end flush with the surface of the walls. Sleeves in floors shall extend one inch above the floor and after installation of piping shall be packed, fire-stopped and made watertight. Sleeves in exterior walls shall have water-stop plates, shall end flush with the surface of the walls, shall have link-seal penetration closures and shall be of a diameter that is compatible with the Link Seal System.

C. Seal the sleeve penetrations with firestopping and smoke stopping systems as manufactured by Dow Corning, Bio-Shield, Rectorseal Metacaulk, 3M, Fyre Putty or equal. Where pipes penetrate fire rated construction, the openings shall be packed with the material and system that shall maintain the integrity of the fire rating as detailed in the UL Fire Resistance Directory.

D. Pipe Sleeves shall be according to the following:

1. Sleeves on pipes passing through masonry or concrete construction shall be scheduled 40 galvanized steel pipe.

2. Sleeves on pipes passing through wood or drywall partitions shall be 16 gauge galvanized steel.

E. Whenever new penetrations to a previously poured slab are required for the installation of floor drains, shower drains, mop receptors, flush floor cleanouts or similar items of

plumbing, these penetrations shall be totally sealed with a fire stop sealant. Sealant shall be Dow Corning fire stop sealant, Catalog No. 2000. Hourly fire rating in hours must be meet the requirements of the slab being penetrated.

G. Provide chrome plated brass escutcheons with set screws for exposed piping in all areas. All escutcheons shall be sized to fit the bare pipe or insulation in a snug and neat manner. They shall be of sufficient size to cover sleeves openings for the pipes and of sufficient depth to cover sleeves projecting above floors. Escutcheons shall be placed on both sides of wall at all pipe penetrations.

H. Seismic Restraints: It is the intent of this seismic specification to keep all plumbing building system components in place during a seismic event.
   1. All plumbing systems must be installed in strict accordance with seismic codes, component manufacturer's and building construction standards. Whenever a conflict occurs between the manufacturer's or construction standards, the most stringent shall apply.
   2. This contractor shall engage a professional structural engineer registered in the jurisdiction of this project if required to review the entire installation to determine all seismic restraint requirements and methods. Contractor shall submit a report outlining the structural engineer’s review as well as seismic restraint shop drawings and supporting calculations prepared by the professional structural engineer for review by the Architect.
   3. Seismic restraints shall be designed in accordance with seismic force levels as detailed in the applicable building code.

2.6 ACCESS PANELS

A. Furnish access panels for access to all concealed parts of the plumbing system that require accessibility such as valves, shock absorbers and cleanouts. Access panels to be installed by others under the appropriate section of the specifications.

B. All access panels shall be located in a workmanlike manner, positioned so that the component can be easily reached and the size shall be sufficient for this purpose (minimum size 12-in. square). Location of access panels will be submitted for approval prior to installation.

C. Access panels shall be prime painted with cam lock, as manufactured by Inland Steel Products Co. Milcor, Miami Carey or Wayloctor or an approved equal. Provide fire rated access panels where required by applicable code. They should be as follows:
   1. Drywall Surfaces: Acudor DW-5040
   2. Masonry Construction: Acudor UF-5000
   3. Plastered Surfaces: Acudor PS-5030

D. Access panel shop drawings shall be submitted to the Architect for approval.

2.7 PLUMBING FIXTURES

A. Plumbing fixtures shall be of the best quality as fabricated by a manufacturer of established reputation.

B. Where required all plumbing fixtures installed shall be ADA and AAB compliant.

C. All fixtures shall have the manufacturer's guarantee label or trademark indicating first quality.

D. All plumbing fixtures shall meet EPA water sense requirements.

E. Water closets: Vitreous china tank type watercloset with concealed cistern and push panel flush system. Waterclosets shall be equipped heavy-duty bowls and seats with heavy-duty mounting supports. Provide a large bore toilet waste pipe with an inspection chamber behind the toilet pan. Toilets shall not exceed 1.28 GPF.

F. Lavatories: Vitreous china center-set wall hung lavatory with low-flow, faucet with thermostatic mixing valve. Locate thermostatic mixing valve as high as possible under sink. Provide water-level monitors; oversized cleanouts and debris trap.

G. Kitchen sinks & faucets: Single bowl 22”x25” stainless steel sink with sink base faucet, low flow gooseneck, ADA compliant lever handles where required and debris trap.

H. Shower units: One-piece seamless acrylic shower unit. Low flow shower head. Refer to Architect’s drawings.

I. Floor drains: Provide a floor drain in all water entrance rooms. Floor drains shall be equipped with trap primers.

J. Provide a pan with water sensor alarm under all washing machines in laundry rooms.

K. All materials specified to be chromium plated shall be thoroughly cleaned and polished before plating and plate shall be heavily, thoroughly and evenly plated, guaranteed not to strip or peel.

L. Where escutcheons are not furnished with plumbing fixtures, this Contractor shall supply them. Fixtures shall meet the requirements for the conservation of hot and cold water as noted in the State Plumbing Code.

M. Each fixture shall be separately trapped, using the type and size of trap required by the Plumbing Code or as specifically denoted otherwise. Unless otherwise specified, faucets and all exposed fittings and pipe shall be chrome plated.

2.8 PIPING ACCESSORIES

A. Furnish and install vacuum reliefs, Watts Regulator Co., or approved equal.

2.9 SHOCK ABSORBERS AND EXTERIOR NON-FREEZE WALL HYDRANTS

A. Maintenance free water hammer arresters shall be furnished and installed at all locations in the water systems where quick acting valves are installed as well as wherever water hammer may occur.

B. Water hammer arresters shall be as manufactured by Josam Manufacturing Company, Jay R. Smith Manufacturing Company or Zurn Systems. Arresters shall be installed at each and every multiple of fixtures or items as listed above and/or as indicated on drawings. Water hammer arresters may serve groups of fixtures. Sizing and placement shall be in accordance with PDI Standard PDI-WH-201 and the manufacturer’s recommendations.

C. Water hammer arresters shall be as follows:

Designation	Fixture Unit Rating	Model
1. SA “A”	1-11	Jay R. Smith 5005
2. SA “B”	12-32	Jay R. Smith 5010
3. SA “C”	33-60	Jay R. Smith 5020
4. SA “D”	61-113	Jay R. Smith 5030
5. SA “E”	114-154	Jay R. Smith 5040
6. SA “F”	155-330	Jay R. Smith 5050

D. Air chambers will not be approved as an equal.

E. Access panels shall be required at shock absorbers.

F. Install lockable “keyed” non-freeze wall hydrants on each side of the building for lawn irrigation.

2.10 FIRE SAFING

A. Where piping passes through fire rated walls, floors and ceilings, provide a fire safing system so as to maintain the integrity of the rated assemblies to the satisfaction of the Architect and the Building Inspector. The fire safing system shall be as manufactured by 3M, Dow, Bio-Fire Shield, or Nelson. Provide manufacturer's details or custom details when there are not manufacturer's details for each condition with a UL listing referenced. Where piping is insulated, pipe insulation shall run continuously through the rated opening. Details shall show the required depth and annular space width requirements and limitations and any packing requirements.

B. Refer to architectural drawings for rated walls and partitions. Where there are no architectural drawings or they do not indicate rated walls and partitions, the following guidelines shall be used. All floors, corridor walls, party walls, mechanical room walls, duct and pipe chase walls, stairwells, trash room and chute walls shall be considered minimum two hour fire rated walls.

C. Products for fire safing of PVC piping shall be Proset System "C" or approved equal.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Prior to the work of this section, this Contractor must ascertain that preceding work has been accomplished in a manner to permit compliance with the level of quality required by this Section.

B. The entire work provided in this specification shall be constructed and finished in every respect in a workmanlike and substantial manner. It is not intended that the drawings shall show every pipe, fitting, and appliance. Furnish all parts as may be necessary to complete the system in accordance with the best trade practices and to be the satisfaction of the Architect, Engineer and General Contractor.

C. This Contractor shall keep other contractors fully informed as the shape, size and position of all openings required for his apparatus and shall give full information to the General Contractor or other contractors sufficiently in advance of the work so that all openings may be built in advance. Furnish and install all sleeves, supports, etc., specified or required.

D. In the case of failure on the part of this Subcontractor to give proper and timely information as noted above, he shall do his own cutting and patching, or have same done by the General Contractor at this subcontractor's expense, but in any case, without extra expense to the Owner and General Contractor.

E. This Contractor shall obtain detailed information from the manufacturer of apparatus as to the proper method of installing and connecting same. He shall also obtain all information from the General Contractor and the other contractors which may be necessary to facilitate his work and the completion of the whole project.

3.2 TESTING PIPING SYSTEMS

A. Test all work in the presence of the Architect/Engineer and/or Owner, Owner's representative and Plumbing Inspector as called for in local codes.

3.3 PROTECTION AND CLEANING

A. Each subcontractor shall be responsible for his work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment, which are not immediately installed after delivery on site. Close open ends or work with temporary covers or plug during construction to prevent entry of obstructing materials.

B. Each subcontractor shall protect work and materials of other trades from damage that might be caused by his work or workman and make good damage thus caused.

C. The premises shall be kept reasonably clean at all times, and rubbish shall be removed as directed by the General Contractor.

D. Upon completion of this work, the Contractor shall clean all fixtures and equipment and replace damaged parts. Upon failure of this Contractor to fulfill his obligation, this work will be taken care of at his expense.

3.4 WORK COORDINATION AND JOB COORDINATION

A. Plumbing equipment shall not be installed in congested and possible problem areas without first coordinating the installation of same with the other trades and the General Contractor.

B. Particular attention shall be directed to the coordination of system with all equipment of other trades installed in and above the ceiling areas. Conflicts in heights and clearance above hung ceilings shall be brought to the attention of the General Contractor for a decision before equipment is installed.

C. Furnish to the General Contractor and other trades all information relative to the position of the plumbing installation that will affect them so that they may plan their work and installation accordingly.

3.5 SUPPLEMENTARY STEEL, CHANNEL AND SUPPORTS

A. Furnish and install all supplementary steel, channels and supports required for the proper installation, mounting and support of all equipment.

B. Supplementary steel and channels shall be firmly connected to building construction in a manner approved by the Architect/Engineer.

C. The type and size of the supporting channels and supplementary steel shall be determined by the Plumbing Subcontractor and shall be sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

D. All supplementary steel and channels shall be installed in a neat and workmanlike manner parallel to the walls, floor and ceiling construction. all turns to be made with 90 degree fittings, as required to suit the construction and installation conditions.

3.6 SLEEVES AND INSERTS

A. Sleeves shall be furnished, set and properly secured in place and at all points where piping passes through masonry or concrete. All sleeves shall be of sufficient diameter to provide 1/4-in. clearance around the pipe.

B. Sleeves through concrete slabs, and interior concrete and masonry walls or partitions

shall be steel pipe. Fire stop annular openings between sleeves and pipes at floor slab passages and make watertight. Galvanized sleeves and copper piping shall not be placed in concrete.

C. Install UL listed and FM approved inserts or other anchoring devices in concrete and masonry construction as required to support piping. Inserts shall be of the adjustable type as manufactured by Carpenter and Patterson, Grinnell, or Fee and Mason.

3.7 INSERTS AND OPENINGS

A. Inserts: Install inserts or other anchoring devices in concrete and masonry construction as required to support piping. Inserts shall be of the adjustable type as manufactured by Carpenter and Patterson, Grinnell of Fee and Mason.

B. Escutcheons: All exposed pipe, uncovered, passing through walls, floors or ceilings shall be fitted with one piece chrome plated brass escutcheons with set screw holding in position. Floor escutcheons to be deep enough to fit over sleeves, fastened to pipe and extending down to floor.

3.8 SANITARY WASTE AND VENT SYSTEMS

A. Furnish and install piping to take wastes from all soil and waste stacks, fixtures, drains and equipment.

B. Unless specifically noted otherwise on the plans, all horizontal piping 3 in. and larger shall be pitched at the rate of 1/8 in. per foot in the direction of the flow. Horizontal sanitary piping smaller than 3” shall be pitched at the rate of 1/4 in. per foot in the direction of the flow.

C. Vent System: Furnish and install piping to vent all stacks, fixtures, traps and appliances. All vent piping shall be concealed where possible with the horizontal pipe pitching back toward fixtures to allow connection to drain. Whether indicated on plan, riser diagram or not, offset vents below the roof to avoid air intakes, equipment, penthouse mansard etc., bring vents through the roof a minimum of 25 ft. away from air intakes, windows, and operable sash and 10 ft. away from other obstructions.

3.9 HOT AND COLD WATER SYSTEMS

A. Furnish and install complete cold, hot and hot water return systems to service all requiring cold or hot water. Cold water piping shall start at the connection to the water main and extend to all fixtures and equipment, including piping, fittings and valves requiring connections. Hot water piping shall extend from the hot water heater to all fixtures and equipment, including piping, fittings and valves. In general, piping shall pitch upward in the direction of flow with each branch and riser separately valved and with 1/2 in. hose end drains on the outlet side of the valve and at all low points in the systems. Install valves for each battery of fixtures and other valves as necessary to isolate all parts of these systems. All valves shall be accessible. Piping shall be concealed in walls, above ceilings or in pipe chases. Do not install piping in areas subject to freezing. Do not install piping in exterior walls.

3.11 CHLORINATION

A. All water lines and water service shall be thoroughly flushed and chlorinated before being put into service. The domestic cold and hot water systems shall be chlorinated and flushed in accordance with the requirements of the State Plumbing Code and Local Inspector.

B. Submit a certificate of compliance when chlorination has been completed stating when

performed, by whom and who witnessed the procedure.

END OF SECTION

SECTION 230000 – MECHANICAL

PART 1: GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

1.2 SUMMARY OF WORK

A. Provide complete functional Heating, Ventilating and Air Conditioning system as shown on Mechanical Construction Documents.

1.3 REFERENCE STANDARDS

A. NFPA Standards

B. ANSI Standards

C. ASME Standards

D. ASTM Standards

E. AWWA Standards

F. ASHRAE Standards

G. SMACNA Standards

H. OSHA Standards

I. NEBB Standards

J. Local Codes and Ordinances

K. Owner’s Insurance Company Requirements

L. Where the contract documents indicate more stringent requirements than the above codes and ordinances, the contract documents shall take precedence.

M. File all documents, pay all fees and secure all permits, inspections and approvals necessary for the work of this section.

1.4 CONTRACT DRAWINGS & SPECIFICATIONS

A. The Contract Drawings are generally diagrammatic and convey the Scope of Work and General Arrangement of apparatus and equipment. The locations of all items shown on the drawings or called for in the specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project and shall have the approval of the Architect and Engineer before being installed. The Subcontractor shall follow drawings in laying out work and shall check drawings of the other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. If directed by the General Contractor, Engineer and/or Architect, the Subcontractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or before proper execution of the work.

B. Specifications: The specifications are intended only to complement the drawings; however, work detailed and/or noted only on the drawings or work described only in the specifications shall all be considered as part of the scope of work.

1.5 CONFLICT BETWEEN PLANS AND SPECIFICATIONS

A. In case of conflict between the contract drawings and specifications, the Engineer shall determine which takes precedence.

1.6 SHOP DRAWINGS AND PRODUCT DATA

A. SUBMITTALS: Submit shop drawings, manufacturers data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication, or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable industry, and technical society publication references, and other information necessary to establish contract compliance of each item the Contractor propose to furnish.

B. Submit in accordance with Division 1.

C. It is the intent of these specifications that all equipment, materials and workmanship used on this project be in complete conformance with all local, state and national codes, ordinances and standards.

D. Substitutions shall be equivalent to specified equipment in all aspects of quality and performance and shall conform to the intent stated above. It is the contractor's responsibility to submit only those items that meet these requirements. Should any non-conforming items be installed, they shall be replaced by the contractor at no additional cost to the owner.

E. The approval of the equipment does not relieve the Subcontractor of responsibility of shop drawing errors related to details, sizes, quantities, wiring diagram arrangements and dimensions which deviate from the Specifications, and/or job conditions as they exist.

F. Refer to General Requirements for the substitutions of equipment and submittal of shop drawings. If apparatus or materials are substituted for those specified, and such substitution necessitates changes in, or additional connections, piping, supports, or construction, it shall be provided. Contractor to assume cost and entire responsibility thereof.

1.7 INSPECTION AND TESTS

A. During the progress of the work it shall be subject to the inspection of the Owner and to such other inspectors, as may have jurisdiction.

B. At completion of the work, Contractor shall submit to the Owner's representative in writing a statement stating: (1) that the work is complete; (2) that the entire installation is in accordance with the specification; (3) that preliminary tests have been made; and (4) that the work is ready for final inspection and test.

C. A final inspection of the installation to determine compliance with the drawing and specifications will be made by the Owner's representative. Work will be checked for quality of materials, quality of workmanship, proper installation and finished appearance. This Contractor shall provide the services of the project foreman for inspection purposes. The foreman shall remove and reinstall access panels, ceiling tiles, etc., as required to facilitate any inspections required by the Owner's representative.

D. The Contractor shall arrange and conduct operating tests on all equipment in the presence of the Owner's representative. The component parts of systems and the various systems shall be demonstrated to operate in accordance with the requirements and intent of this specification. Any non-complying or defective materials or workmanship disclosed as a result of the inspection and the Contractor shall correct tests promptly, and the tests repeated as often as necessary until approved and accepted by the Owner's representative.

1.8 ELECTRICAL EQUIPMENT

A. Electrical components of mechanical equipment and systems, such as motors, factory mounted motor starters, disconnects, and control equipment shall be provided under the related Section of Division 23.

B. Temperature control equipment, including thermostats, zone valves, relays, aquastats, etc. shall be provided under related sections of Division 23. Temperature control wiring not specifically shown on electrical drawings shall be provided under related Section of Division 23.

C. Upon completion of temperature control system wiring, the responsibility of the control system will fall under Division 23.

D. All electrical equipment installed in concealed spaces shall be provided with a hard-wired electrical connection. Plug-type disconnects shall not be allowed in concealed spaces. Equipment provided with plug-in cords shall not have their cords modified.

1.9 OPENINGS IN EXTERIOR WALLS OR ROOF

A. Openings in exterior walls or roof shall be kept properly plugged and caulked at all times, except when being worked on to preclude the possibility of flooding due to storm or other causes. After completion of work, openings shall be permanently sealed and caulked in a manner approved by the Architect.

1.10 GUARANTEE

A. Except as otherwise specified, all work, materials and equipment shall be guaranteed against defects resulting from the use of inferior materials, equipment, or workmanship for one year from the date of final completion of the contract, or from full acceptance by the Owner, whichever is earlier.

B. If, within any guarantee period, repairs or changes to guaranteed work are required as a result of the use of defective materials or equipment, inferior workmanship or work that is not in accordance with the terms of the contract, and upon receipt of notice from the Owner, the following shall be done without expense to the Owner.

C. Place in satisfactory condition in every particular all of such guaranteed work and correct all defects therein.

D. Repair all damage to the building or site/equipment or contents thereof which is the result of the use of defective materials or equipment or inferior workmanship, or of work not in accordance with the terms of the contract.

E. Make good any work or materials, or the equipment and contents of said building or site disturbed in fulfilling any such guarantee.

F. In fulfilling the requirements of the contract or of any guarantee embraced in or required thereby, any work guaranteed under another contract is disturbed, restore such disturbed work to original condition and guarantee such restored work to the same extent as it was guaranteed under such other contract.

G. If upon failure to proceed promptly after notice to comply with the terms of the guarantee, the Owner may have the defects corrected and Contractor and his surety shall be liable for all expenses incurred.

H. This Contractor shall obtain in the General Contractor's and Owner's name, the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities, which the Contractor may have by law or other provisions of the Contract Documents. The guarantee shall be for a period of one (1) year minimum from the date of acceptance or final payment.

1.11 CLEANING OF SYSTEM

A. Thoroughly clean piping, ducts, fixtures and equipment of all foreign substances inside and out before placing in operation. All air handling equipment shall be provided with “construction filters” for use during construction. Once construction is substantially complete and prior to final testing adjusting and balancing, furnish and install new filters for each piece of equipment.

B. If any foreign matter should stop any part of a system after being placed in operation, clean and reconnect system.

C. Remove all covers of interior floor drains and cleanouts, clean of all dirt, concrete traces, etc., then lightly grease and reinstall.

D. Existing HVAC systems which are being tied into or otherwise modified shall be thoroughly cleaned and refurbished prior to being placed back in service.

1. Duct Systems shall be cleaned of all foreign contaminants, dust and debris.
2. Hydronic Systems shall be fully flushed, cleaned, refilled and treated.
    a) Contractor shall test existing system fluid to determine the concentration of freeze-inhibitor in the system prior to drain down.
    b) Refilling of the system shall include freeze inhibitor matching the concentration of the system prior to drain-down.
3. During contractor shall bring to the attention of the owner and engineer any perceived deficiencies in existing systems including but not limited to:
    a) Code deficiencies
    b) Inoperable equipment
    c) Leaking ductwork and/or piping
    d) Missing or deteriorating insulation
    e) Excessive noise

1.12 TEMPORARY OPENINGS

A. Coordinate construction and provide temporary openings in the building as required for the admission of equipment furnished under this Division.

1.13 DEFINITIONS

A. "Piping" includes, in addition to pipe, all fittings, valves, hangers, and other accessories relating to such piping.

B. "Concealed" means hidden from sight in trenches, chases, furred spaces, shafts, hung ceilings, embedded in construction or in crawl spaces.

C. "Exposed" means not installed underground or "concealed" as defined above.

D. "Provide" means furnish and install complete and ready to operate.

1.14 EQUIPMENT DEVIATIONS

A. Where proposals to use an item of equipment other than that specified which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the Architect at the Contractor’s expense.

B. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the drawings, furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors,

starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

1.15 ELECTRICAL ROOM REQUIREMENTS

A. Do not install any piping, ductwork or equipment in or through electrical rooms, transformer rooms, electrical closets, telephone rooms or elevator machine rooms, unless piping or ductwork of equipment is intended to serve these rooms. Additionally, no ductwork or piping will be installed above electric panels. If the Contractor violates this requirement, he shall remove and/or relocate all items as required at his expense and to the satisfaction of the Architect.

1.16 COOPERATION WITH OTHER TRADES

A. Give full cooperation to other trades and furnish in writing to the Architect any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

B. Coordination drawings shall be initiated by this contractor. It this contractor’s responsibility for preparation of project coordination drawings showing the installation of all equipment, piping, ducts and accessories to be provided under Section 230000 of the Specifications.

1. Drawings shall be prepared at not less than 1/4 in. = 1 ft. scale, and shall show building room layouts, structural elements, ductwork and lighting layouts of function. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.
2. A reproducible copy of each drawing prepared shall then be submitted to each Contractor working under Sections 210000, 220000, and 260000, who shall be responsible to coordinate his equipment and systems and shall show these on the drawings submitted.
3. After each Contractor has fulfilled his obligation, he shall return the drawings to the HVAC Contractor. After each drawing has been coordinated between trades, and appropriate revisions made, each trade shall sign each drawing, indicating acceptance of the installation.
4. The HVAC Contractor shall then print the coordination original and these prints submitted through the General Contractor to the architect for review and comment, similar to shop drawings. Comments made on these drawings shall result in a correction and re-submittal of the drawings.

C. Furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.17 PROJECT RECORD DOCUMENTS:

A. Each Contractor shall record clearly, neatly, accurately, and promptly as work progresses the following data:

1. Changes made resulting from change orders or instructions issued by the Architect.
2. Changes in routing made to avoid conflict with other trades or structural conditions.
3. Final location of equipment and panels if different than contract documents.

B. Upon completion of the project submit to the Architect a set of electronic media noting "as built" conditions indicating all variations and deviations of his work from contract documents.

1.18 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

A. Operating Instructions: Provide operating instructions to the Owner's designated representative

with respect to the operation functions and maintenance procedures for all equipment and systems installed. The cost of providing a manufacturer's representative at the site for instructional purposes shall be included in the Contract Price.

B. Maintenance Manuals: At the completion of the project, turn over to the General Contractor four (4) complete manuals in 3-ring binders, indexed, containing the following:

1. Complete shop drawings of all material and equipment of this section.
2. Operation descriptions of all systems.
3. Names, addresses and telephone numbers of all suppliers of system components.
4. Preventative maintenance instructions for all systems.
5. Spare parts list of all system components.
6. Copies of all valve charts.

1.19 PROTECTION

A. Protect all work and material from damage by work and workmen, and accept liability for all damage thus caused.

B. Be responsible for work and equipment until finally inspected, tested, and accepted. Protect work against theft, injury or damage; and carefully store material and equipment received on site, which is not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of obstructing material.

C. All openings in stored & installed ductwork shall be covered & sealed when not in use to prevent contamination from dust & debris.

1.20 SCAFFOLDING, RIGGING AND HOISTING

A. Provide scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of material, equipment and apparatus furnished under this division. Remove same from premises upon completion of work.

B. Coordinate propose routing with architect prior to rigging and protect all existing building components against damage.

1.21 MATERIALS AND WORKMANSHIP

A. All materials and apparatus required for the work, except as specifically specified otherwise, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail, and shall be so selected and arranged as to fit properly into the building spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by the Architect shall be furnished.

B. Furnish the services of an experienced foreman who shall be constantly in charge of the installation of the work, together with all skilled workmen, fitters, metal workers, welder, helpers, and labor required to unload, transfer, erect, connect, adjust, start, operate, and test each system.

C. All equipment and materials shall be installed in strict accordance with the manufacturer’s recommended installation instructions as well as UL Listing instructions and all Local, State and National codes.

1.22 QUIET OPERATION AND VIBRATION

A. Work shall operate under all conditions of load without any objectionable sound or vibration. In case of moving machinery, sound, or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or

vibration conditions considered objectionable shall be corrected in an approved manner at no expense to the Owner. Vibration control shall be means of approved vibration eliminators in a manner as recommended by the manufacturer of the eliminators.

1.23 ACCESSIBILITY

A. Assure and be responsible for the adequacy of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of the work. Cooperate with all other trades whose work is in the same space. Such spaces and clearances shall, however, be kept to the minimum size required.

B. Locate all equipment, which must be serviced, operated, adjusted or maintained fully accessible positions. Equipment shall include, but not be limited to, valves, traps, cleanouts, motors, controllers, filters, dampers, starters, coils, fire dampers, smoke dampers and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility, and the engineer shall approve any change.

C. Provide access panels for installation in concrete block walls or gypsum wallboard ceilings and partitions in locations, which require access for service to the items located behind the permanent gypsum wallboard or concrete block finish.

D. Access panels shall be installed where required to gain access to valves, dampers, controls, etc. Panels shall be flush, insulated, contain continuous steel hinge and screwdriver operated latch. Panels shall be rated equal to the assembly that they are being installed in panels shall be UL listed.

E. Access panels located in fire rated partitions shall be fire panels. The frame and panel assembly of these fire panels shall be manufactured under the Factory Inspection Service of the Underwriters' Laboratories, Inc., and shall bear a label reading: "Frame and Fire Panel Assembly, Rating 2 hours. (B) Temperature Rise 30 Minutes, 250° F. Maximum." Rated panels shall be equipped with automatic closing mechanism and be self-latching.

F. Panels shall be provided with screwdriver operated flush cam locks.

G. Panel size shall be 12 inches x 12 inches except furnish a larger size if required to service a particular item. The exact location and size of each access panel shall be reviewed with, and approved by, the Engineer.

H. The exact location and size of each access panel shall be noted on a shop drawing and reviewed with, and approved by, the Architect and Engineer in writing prior to installation.

1.24 CUTTING AND PATCHING

A. Provide all cutting and patching necessary to install the work specified in this division. Patching shall match adjacent surfaces.

B. At floor slabs & wall openings to be cored drilled or cut, contractor shall find and mark on both faces all reinforcing, rebar, conduits, utilities, etc.. by means of x-ray, pach-ometer or prof-ometer. Submit sketch showing locations of all findings and proposed cuts or cores for review.

C. No structural members shall be cut without the approval of the Structural Engineer, and all such cutting shall be accomplished in a manner directed by the Structural Engineer.

1.25 GROUNDING

A. All components of mechanical piping systems shall be properly grounded to building ground. Where ground path is interrupted by non-conductive materials, appropriate bonding or grounding to building ground shall be provided.

1.26 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Architect before work is started. Furnish all necessary sleeves required.

1.27 DEMOLITION

A. Prior to submitting bid, visit site and identify existing conditions and difficulties that will affect work of this section. Demolition work will require careful site examination prior to bidding. No compensation will be granted for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observers.

B. Prior to commencing demolition, contractor shall identify with owner any equipment to be returned to the owner after demolition. All other debris shall be disposed of by this contractor in accordance with all applicable regulations. Any shutdowns required for demolition shall be coordinated with building owner to avoid impact to operations.

C. During demolition, any equipment, ductwork, piping, etc. found to be abandoned shall be demolished. Existing unused connections to existing ducts or piping shall be cut back to the mains and capped accordingly.

D. Under demolition, the following is, in brief, the extent of the work to be performed by the mechanical contractor under this contract.

1. The mechanical contractor shall be responsible for the disconnection and removal of the existing mechanical equipment, ductwork, piping, valves, etc.,in designated areas. Cut & cap piping and ductwork back to mains. Patch all roof and wall penetrations to match existing.
2. This contractor shall protect work against injury or damage; and carefully store material and equipment to be relocated. Open ends of work shall be closed with temporary covers or plugs during storage and construction to prevent entry of obstructing material.
3. All existing HVAC components, including but not limited to ductwork, piping, equipment, controls & accessories, shall be removed from the area of renovation.
4. Coordinate all demolition with other trades to ensure all relevant portions of the system including associated electrical and plumbing components are removed.
5. Refer to drawing plans and notes for additional information.

1.28 TEMPORARY HEAT

A. The building must remain in full operation during the construction period. This contractor shall provide temporary space conditioning, hot water heating, and/or domestic water production for the duration of time which the existing systems are inoperable or have owner approval for any downtime.

B. This contractor shall provide a minimum of 48 hours' notice of any shutdowns and coordinate maximum allowable system downtimes with the Owner and/or Director of Operations prior to the start of work.

C. This contractor shall be responsible for providing temporary heating equipment at any point during construction as required to maintain laborer comfort and avoid damage to the building or any of its associated components, systems, or equipment.

D. Contractor shall provide all temporary or permanent equipment, materials, and labor to ensure these stipulations are met.

E. Temporary heating requirements shall be coordinated with the electrical and plumbing contractor as required. This contractor shall carry all costs associated with utilizing other

contractors to provide materials or labor for temporary services indicated above.

1.29 REBATES

A. The contractor shall make the owner aware of all applicable “upstream” energy rebates available for this project.

B. The contractor shall provide the owner all necessary information and documentation for completion and submission of energy rebate applications.

PART 2: PRODUCTS

2.1 IDENTIFICATION, MARKING AND TAGGING

A. Systems and equipment to be identified and marked and valves tagged include, but are not limited to the Heating, Air Conditioning & Ventilating systems.

B. Submit samples of marking and tagging devices and wording, lettering and numbering scheme for each system.

C. Equipment Identification:

1. Manufacturer's nameplates or trademark shall be permanently affixed to all equipment and materials furnished under this division. Manufacturer's nameplates shall include all pertinent data relative to the piece of equipment including model number, serial number, and operating characteristics as applicable.

2. Separate Equipment Identification Markers shall identify each item of equipment with a permanently attached marker indicating designation and/or number corresponding to design documents.

3. Markers shall be of rigid black Bakelite or phenolic construction with white engraved or incised letters.

4. Lettering on equipment markers shall be of adequate size to be legible from floor levels. In all cases marker lettering shall no be less than 1 inch high.

D. Piping System Identification:

1. Piping Systems shall be identified as indicated herein or as required by applicable codes and/or officials having jurisdiction.

2. Pipe Markers shall be color coded according to " Designations to Colors" - ASME A13.1-2007.

3. All piping and equipment shall be identified by pipe markings, which shall be provided by this Contractor. Markers shall be applied every 20 ft. Markings shall indicate pipe content, system, operating pressure & temperature, and direction of flow. The markers shall be as manufactured by Seton Name Plate Corp. or equal

4. Pipe Markers shall be of the pressure sensitive type as manufactured by the Seton Nameplate Corp. (F10-Code)

5. Valve Identification: Provide laminated plastic nameplates on all valves installed under Division 23, except stop valves in supplies to fixtures. Tags shall be constructed of 0.125 inches thick melamine plastic conforming to Fed. Spec. L-P-387. Surface shall be matte finish. Accurately align lettering and engrave into white core. Nameplates shall be to 2 inches round or hexagonal. Lettering shall be minimum of 0.375 inch high normal block lettering. Key the nameplates to a chart and schedule for each system. Frame one chart and schedule for each system under glass and place where directed in mechanical room. Furnish four copies of each chart and schedule. Each inscription shall identify its function. Attach nameplates with "S" hooks and chain to each valve. Valve nameplates shall be numbered and "keyed".

2.2 SLEEVES, INSERTS AND ESCUTCHEONS

A. Provide sleeves for all work passing through floor, wall, and ceiling construction. Locate and provide sleeves and inserts before the floor, wall or ceiling is constructed. If this contractor does not comply with the above, he shall bear all costs incurred for cutting and patching required for the installation of sleeves and inserts. Holes required for sleeves in existing walls and floors, or to conform to the above shall be saw cut or core drilled. This Contractor shall provide all drilling required for the installation of hangers.

B. Pipe sleeves through outside walls shall be Schedule 80 black steel pipe with 150 lb. black steel slip-on welded flanges welded at the center of the outside. Extend sleeves 1/2 inch beyond each side of the wall. Pack the space between sleeve and pipe with oakum to within 2 inches of each face of the wall. Pack the remaining space and make watertight with an approved waterproof compound.

C. Pipe sleeves through concrete floors or interior masonry walls shall be Schedule 40 black steel pipe, set flush with finished wall or ceiling surfaces, but extending 2 inches above finished floors. Plastic, PVC, or light metal sleeves shall not be installed.

D. Provide individual or strip type inserts pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4-inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods to 1/2 inch diameter to be passed through the insert body. Strip inserts shall have attached rods with hooded ends to allow fastening to reinforcing rods.

E. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe and the insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations.

F. Provide 22 gauge galvanized steel duct sleeves through interior walls, floors and ceilings set flush with finished surfaces.

G. Pack the space between sleeves and structure, and sleeves and pipes or ducts passing through fire rated interior walls, floors, and ceilings with an approved fire and smoke proof packing material. Fire-stopping material shall maintain its dimensions and integrity while preventing the passage of flame, smoke, and gases under conditions of installation and user when exposed to the ASTM E119 time-temperature curve for a time period equivalent to the rating of the assembly penetrated. Cotton waste shall not ignite when placed in contact with the non-fire side during the test. Fire-stopping material shall be non-combustible as defined by ASTM E136; and in addition, for insulation materials, melt point shall be a minimum of 1700 degrees F. for 1-hour protection and 1850 degrees F. for 2-hour protection.

H. Fasten sleeves securely in floors, walls, etc. so that they will not become displaced when concrete is poured or when construction is built around them. Take precautions to prevent concrete, plaster, or other materials being forced into the space between pipe and sleeve during construction.

I. In all areas where ducts are exposed and pass through floors, the hole shall be surrounded by a 4-inch high by 3-inch wide concrete curb, or otherwise protected as determined by the Engineer.

J. Escutcheon plates shall be provided for all exposed un-insulated pipes passing through walls, floors, and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the pipe. Where plates are provided for pipes passing through sleeves, which extend above the floor surface, provide deep recessed plates to conceal pipe sleeves.

2.3 SUPPORTS & ATTACHMENTS

A. Provide all necessary supports and bases required for all equipment, piping and for all other equipment furnished under this contract. Submit shop drawings to the Architect for approval

before purchase, fabrication or construction of same.

B. All equipment, unless shown otherwise, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are not strong enough shall be replaced as directed.

C. Vibration Isolation: All mechanical equipment, piping and ductwork shall be mounted on vibration isolators/inertia bases to prevent the transmission of vibration and mechanically transmitted sound to the building structure.

1. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.
2. All isolators and isolation materials shall be of the same manufacturer and shall be certified by the manufacturer.

2.4 ELECTRIC MOTORS STARTERS

A. Electric motors and starters shall conform to requirements of the AIEE, NEMA, UL, and NEC and shall be suitable for load duty, voltage, phase, frequency, service and location required. Provide inverter duty rated motors for use with variable frequency drives. Provide shaft grounding rings for all VFD controlled motors.

B. All motors shall be rated at 85% power factor at full rated load. Motors less than 85% power factor shall be corrected to 90% power factor at the factory. All motors shall be rated high efficiency.

C. Starters shall be Cerus International or equal.

1. Enclosed Non-Combination Starter
    a) Motor Starter shall be enclosed in a Type 1 or Type 4 UL rated enclosure.
    b) Motor Starter shall be rated for NEMA class B motors for AC-3 switching and AC-4 switching.
    c) Controls and annunciation shall include Hand- OFF- Auto keypad. LED indication shall include Hand, Off, Auto, Run and Overload. Overload reset shall be available.
    d) Control inputs shall include: Auto Wet input, Auto Dry input, Permissive Auto input, Damper Status Input and Override Input. Automatic control inputs shall be capable of accepting a transistorized input without the need for interposing relays. Wet control inputs shall accept AC or DC inputs from 10 to 138VACor DC.
    e) Damper control shall be built into the starter to provide 24VAC or 120VAC damper control and monitoring.
    f) Override input shall disable the starter from operating in either Hand or Auto mode.
    g) Protective Functions
        (i) Electronic Overload shall provide phase failure and phase loss protection, stall, and class 1 - 30 selectable overload protection. Phase failure protection shall initiate when phase loss is greater than 70% for 3 seconds or phase unbalance is greater than 50% for more than 5 seconds.
        (ii) Cycling fault protection shall be integral to the starter. Cycling fault shall be enabled whenever the starter is cycled more than 1000 times in a one hour period. This feature shall be selectable to be disabled. Cycling fault shall cause overload LED to blink rapidly.

2. Enclosed Combination Starter

a) Enclosed combination starter shall include all of the above descriptions in addition to either a motor circuit protector with lock-out mechanism, a UL 508 breaker, or a fused disconnect with lock-out mechanism.

b) The Motor Circuit protector shall be a UL listed 508 manual motor starter with magnetic trip elements only. The breaker and shall carry a UL 508F rating (up to 100A frame size) which provides for coordinated short circuit rating for use with the motor contactor and provides an interrupting rating for the breaker and contactor combination.

c) Fused disconnect shall be UL 98 suitable for service entrance protection.

d) UL 508 breaker shall include thermal and magnetic trip mechanisms.

2.5 USE OF INSTALLATION

A. The Owners shall have the privilege of using any part of the installation when sufficiently complete, but such use thereof, or partial or final payment shall not be considered as an acceptance of such work in lieu of a written certificate from the Engineer.

2.6 DUCTWORK

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, supports and sealing for operating pressures indicated.

B. Duct gauge shall be as required by SMACNA Duct Construction Standards taking into account duct size, supports, pressure rating, and any other relevant parameters. All ductwork, regardless of SMACNA Standards, shall be no thinner than 26 gauge.

C. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90.

1. Sealant: As recommended by manufacturer specifically for sealing joints and seams in ductwork.

2. Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

3. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

D. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

E. Flexible Ductwork: Duct shall be Flexmaster Type 4 Insulated Duct as manufactured by Buckley Associates or approved equal.

1. Flexible duct (insulated) shall be Underwriters Laboratory Listed (UL 181 Class I Connector) and constructed in accordance with NFPA Standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.

2. Duct fabric shall be of a smooth airtight polymer film mechanically locked to the outside helix. (Use of adhesives to lock to fabric in place is unacceptable.) The helix is constructed of corrosive resistant galvanized steel, formed and mechanically locked to the duct fabric on the outside to prevent tearing of the flexible duct.

3. Insulated flex shall have a fire retardant polyethylene outer jacket with a 1/2 lb. density, 1-1/2” thick fiberglass insulation blanket, factory wrapped.

4. The flexible duct shall be supported as required to prevent sagging. Flexible duct with excessive sagging will not be approved.

5. Flexible ductwork shall be rated at 6” positive pressure and 10” negative

pressure for sizes up to 12”. Negative pressure for 14” to 16” shall be 5”. Negative pressure for 18” shall be 1”.

6. Length of installed flexible duct shall not exceed 6’-0” in developed length.

F. Flexible Connections

1. Flexible connections shall be provided where a fan connects to a duct or casings to prevent transmission of vibration to ductwork.
2. Flexible connections shall fit tightly around ducts and fans and be securely bolted or clamped in place. Taping shall not be allowed.
3. Flexible duct connections shall be 6” long and made of straight, waterproof, flame retardant fabric having a flame spread rating of not over 25 and a smoke development rating of not over 50

G. Existing Ductwork: Any existing ductwork within the area of work or connected to systems within the area of work shall be professionally cleaned by a experienced certified duct cleaning company. Contractor shall submit before/after photographs of each duct system cleaned.

H. Volume Dampers:

1. Provide Young Regulator manual adjustable rectangular opposed blade dampers for duct heights less than 12” with factory-installed locking hand quadrants extended 2” for all dampers installed in externally insulated duct:
    a) On each supply, return and general duct take-off.
    b) At each take-off to register, grille or diffuser (not all are shown on drawing).
2. Dampers are manufactured approximately 5/16” smaller in width and 1/8” smaller in height than size of duct in which they are installed; e.g., nominal damper size is 24” x 10”; actual size is approximately 23-11/16” x 9-7/8”.
3. Damper frame shall be constructed of #6063 extruded aluminum reinforced channel with minimum thickness of .050”. Opposed damper blades shall be #6063 extruded aluminum with minimum thickness of .050” and shall include reinforcing ribs. Each blade shall be supported in the damper frame by individual Teflon axle bearings, and shall be driven by stainless steel connecting slide linkage controlled by 3/8” square steel control shaft.
4. Note: All required volume dampers may not be indicated on drawings but dampers shall be provided as necessary for systems balancing.
5. Dampers 12” and larger in height shall be opposed multi-blade equal to Greenheck, Nailor or Vent Products.
6. Where dampers are inaccessible, use Young Rectangular locking type ceiling regulators and miter gear or worm gear for all horizontal dampers. Bearing coupling for bottom duct control may be used for shaft on vertical blade dampers. The 3/8” rod between ceiling regulator and damper shall be provided by Contractor.
7. Where dampers are to be located above hard ceilings Young Regulator Bowden Cable Control Dampers shall be utilized. Controllers (actuators) shall be of the concealed ceiling type. Controller type, finish & locations to be approved by architect prior to purchase & installation. The cable between the damper and controller shall be provided by the contractor.
8. Damper blades shall be two gauges heavier than adjoining ductwork, and shall be riveted to supporting rods. Hem over edges parallel to rods.

9. Brackets shall be galvanized metal, secured to ductwork with sheetmetal screw with locking quadrant arms (see seal class section for additional requirements). Provide 2" handle extension for all dampers on externally insulated ductwork.
10. Note: All required volume dampers may not be indicated on Drawings but dampers shall be provided as necessary for system balancing.

2.7 DUCT INSULATION

A. Compliance: Insulation thickness, conductivity and installation shall comply with local Mechanical and Energy Codes. Where local code conflicts with specifications, the more stringent shall apply.

B. Definitions:

1. Conditioned Space: An area, room or space that is enclosed within the building thermal envelope and is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned spaces, where they are separated from conditioned spaces by uninsulated walls, floors, or ceilings or where they contain uninsulated ducts, piping or other sources of heating or cooling,
2. Unconditioned Space: An enclosed space within a building that is not a conditioned space or a semiheated space. Crawlspaces, attics, and parking garages with natural or mechanical ventilation are not considered enclosed spaces.

C. Supply and Return Air Duct Insulation:

1. Insulation: ASTM C553; flexible, foil faced, noncombustible blanket.
   a) Exposed Conditioned
      (i) Supply Air: No Insulation Required
      (ii) Return Air: No Insulation Required
      (iii) Outside Air: No Insulation Required
   b) Concealed Conditioned
      (i) Supply Air: R-Value of 6.0 installed.
      (ii) Return Air: No Insulation Required
      (iii) Outside Air: R-Value of 6.0 installed.
   c) Unconditioned
      (i) Supply Air: R-Value of 8.0 installed.
      (ii) Return Air: R-Value of 8.0 installed.
      (iii) Outside Air: No Insulation Required
   d) Examples
      (i) Supply and return ducts in conditioned space: No Insulation Required by energy code. However insulation shall be provided for concealed cooling supply ducts to prevent condensation. **R-**Value of 6.0 installed.
      (ii) Supply and return ducts in vented attic: R-Value of 8.0 installed.
      (iii) Supply and return ducts in exposed shaft: R-Value of 8.0 installed.
      (iv) Supply and return ducts in unvented attic: R-Value of 8.0 installed.
      (v) Return ducts in indirectly conditioned ceiling spaces: No Insulation Required.
      (vi) Supply and return ducts in vented crawl space: R-Value of 8.0

installed.

(vii) Supply and return ducts below grade: R-Value of 8.0 installed.

2. Vapor Barrier Jacket:
    a) Kraft paper with glass fiber yarn and bonded to aluminized film.
        (i) Moisture vapor transmission: ASTM E96; 0.02 perms.
        (ii) Secure with pressure sensitive tape.
3. Vapor Barrier Tape:
    a) Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Exhaust Ductwork Insulation:
1. Insulation: ASTM C553; flexible, foil faced, noncombustible blanket.
2. Direct Exhaust: No Insulation Required.

2.8 INTERIOR DUCT LINER

A. Polymer Foam insulation (EPFI) equal to IMCOA “IMCOSHEET” Engineered Polymer Foam Insulation, 1 inch thick, R = 4.0, closed cell. Insulation shall be installed as required by the insulation manufacturer. Insulation shall be in compliance with NFPA 90 and 90B. Flame spread shall be less than 25 and smoke density less than 50 per ASTM E-84, NFPA 255, UL 723 Class I and UL 181.

B. Duct lining shall be applied in the following locations:
1. 10’ upstream and downstream from all air handling unit of 10 tons or less.
2. 5’ downstream from all other fan powered units including, but not limited to, fan powered UV boxes.

C. Areas provided with interior duct lining shall also be provided with exterior duct insulation as indicated by these specifications.

2.9 PIPING

A. Hydronic Piping
1. Steel Pipe: ASTM A53, Schedule 40, black.
    a) Fittings: ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings or Victaulic ductile iron ASTM A536/395.
    b) Joints: Threaded, or AWS D1.1,welded or Victaulic grooved joints.
2. Copper Tubing: ASTM B88, Type L, hard drawn.
    a) Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
    b) Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
    c) Joints: Solder, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F or Victaulic grooved joints.

B. Equipment Drains and Overflows
1. Copper Tubing: ASTM B88, Type L, hard drawn.
    a) Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
    b) Joints: Solder, lead free, 95-5 tin-antimony, or tin and silver, with melting

range 430 to 535 degrees F (220 to 280 degrees C) or Victaulic grooved joints.

2. PVC Pipe: ASTM D1785, Schedule 40 and Schedule 80 for sizes 8 inch (200 mm) and larger or ASTM D2241, SDR 21 or 26.
    a) Fittings: ASTM D2466 or D2467, PVC.
    b) Joints: ASTM D2855, solvent weld.

C. Unions, Flanges and Couplings

1. Unions for Pipe 2 Inches (50 mm) and Under:
    a) Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.
    b) Copper Pipe: Bronze, soldered joints.
2. Couplings for Victaulic Grooved Joint Systems for Copper Piping Systems 2 inches and Larger:
    a) Rigid: Style 607 with Grade EHP EPDM gasket rated for –30F to 250F.
3. Provide di-electric fittings waterways wherever copper pipe meets steel pipe or other dissimilar metals.

2.10 VALVES

A. Valve Features

1. General Comply with ASME B31.9 for building services piping, and ASME
2. Valve Design; Valves shall have rising stem, or rising outside screw and yoke stems; except, non-rising stem valves may be used where headroom prevents full extension of rising stems.
3. Pressure and Temperature Ratings As scheduled and required to suit system pressures and temperatures.
4. Sizes unless otherwise indicated, provide valves of same size as upstream pipe size.
5. Operators Provide the following special operator features:
    a) Hand wheels fastened to valve stem, for valves other than quarter turn, by brass nut on a square-topped stem.
    b) Lever handles on quarter-turn valves 6 inch and smaller, except for plug valves. Provide one wrench for every 10-plug valves, and a one years supply of recommended lubricant or sealant.
    c) Chain-wheel operators for valves 2-1/2 inch and larger installed 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.
    d) Gear drive operators on quarter-turn valves 8 inches and larger.
6. Extended Stems where insulation is indicated or specified, provide extended stems arranged to receive insulation.
7. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
8. End Connections: As specified in the individual valves specifications.
9. Threads Comply with ANSI B2.1.
10. Flanges Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.

11. Solder-Joints Comply with ANSI B16.18.
12. Caution: Where soldered end connections are used, use solders having a melting point below 840 degrees. F for gate, globe, and check valves; below 421 degrees. F for ball valves.
13. Groove-Ended Valves Comply with AWWA C606

B. Gate Valves

1. Gate Valves - 2 Inch and Smaller MSS SP-80; Class 150, body and bonnet of ASTM B 62 cast bronze, threaded or solder ends, solid disc, gland packed, N.A. packing.

C. Ball Valves

1. Ball Valves – 1 Inch and Smaller Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; 2-piece construction, bronze body conforming to ASTM B 62, standard (or regular) port, stainless steel ball, replaceable “Teflon” or “TFE” seats and seals, blowout proof stem, and vinyl-covered steel handle. Threaded ends for heating hot water and low-pressure steam.
2. Ball Valves - 1-1/4 Inch to 2 Inch Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; 3-piece construction, bronze body conforming to ASTM B 62, conventional port, stainless steel ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Threaded ends for heating hot water and low-pressure steam.
3. Ball Valves-1/2 inch through 2inch Rated for up to 600 psi WOG, brass body, standard port, threaded ends, 2-piece, chrome-plated brass ball, TFE seats. Victaulic Style 722.
4. Ball Valves-1-1/2 inch through 6 inch. Rated for up to 1000 psi. ductile iron body, standard port, grooved ends, 2-piece, chrome-plated carbon steel ball, TFE seats. Victaulic Style 726.

D. Plug Valves

1. Plug Valves - 2 Inch and Smaller 150 psi WOG, bronze body, straightaway pattern, square head, threaded ends.

E. Globe Valves

1. Globe Valves - 2 Inch and Smaller MSS SP-80; Class 150, body and union bonnet of ASTM B 62 bronze, gland packed, N.A. packing. Bronze trim, composition disc.

F. Butterfly Valves

1. Butterfly Valves - 2 Inch and smaller MSS SP-67; 200 psi, cast bronze body, Viton seals, full port design, stainless steel trim, threaded or solder ends.

G. Check Valves

1. Swing Check Valves - 2 Inch and Smaller MSS SP-80; Class 150 or 200, cast bronze body and cap conforming to ASTM B 62, horizontal swing, with a Teflon disc, and having threaded ends. Valve shall be capable of being repaired while the valve remains in the line.
2. Wafer Check Valves - (Non-Slam) Class 250, cast iron body, replaceable lapped bronze seat, lapped and balanced twin bronze flappers and stainless steel trim. Valve shall be designed to open and close at approximately one-foot differential pressure. Twin flappers shall be loaded with a stainless steel torsion spring to minimize flapper drag and assure even non-slam checking action.

H. Combination Balancing & Shutoff Valves:

1. 2” and Smaller Sizes: 300 psi, threaded or sweat ends, non-ferrous Ametal® brass copper alloy body, EPDM o-ring seals. 4 turn digital readout handwheel for balancing, hidden memory feature with locking tamper-proof setting. Victaulic / TA Hydronics Series 786/787 or Engineer Approved Equal .
2. Koil-Kit™ Components: Install Series 78U union port fitting and Series 78Ystrainer/ball valve combination to complete terminal hook-up at coil outlet

I. Balancing Valves

1. Balancing valves shall be provided on all piping mains and takeoffs as required to balance the system to the flows indicated on the drawings and in the equipment schedules.
2. Balancing valves shall be sized such that the specified flow through the valve generates an input to the flow measurement device that is within the range of accuracy of the device. Oversized valves that generate inputs that are below the range of the device and undersized valves that result in excessive pressure loss are not acceptable. Balancing valve submittals shall indicate size, flow and valve characteristics.

J. Vent Piping

1. Zinc-coated steel conforming to ASTM A120 standard weight, with zinc-coated malleable iron fittings conforming to Fed. Spec. WW-P- 521.

K. Valves

1. Shall be installed with their stems horizontal or above. Valves shall have threaded end connections with a union on one side of the valves.
2. Ball type bronze body, 4 bolt type, Teflon seats and seals 150 psi
3. Check Valves shall be: Mil Spec. MIL-V-18436, Type III Class 150, non-slamming type. Swing check, oil resistant disk

2.11 PIPING ACCESSORIES

A. Dielectric Unions: Unions comprising steel female pipe thread end and copper solder-joint end conforming to dimensional, strength and pressure requirements of Fed. Spec. WW-U-531, Class 1. Steel parts shall be galvanized or plated. Union shall have water-impervious insulation barrier capable of limiting galvanic current to 1% of the short-circuit current in a corresponding bimetallic joint. When dry, it shall also be able to withstand a 600-volt breakdown test.

1. Dielectric Waterways: Electroplated steel or ductile-iron nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig maximum working pressure at 230 deg F. Victaulic Style 47.
2. Joints between different piping materials shall be made with a mechanical joint or dielectric fitting.

B. Strainers: Single basket type, with inlet and outlet on the same center line. Cast steel or fabricated steel body, mesh 300-series stainless- steel baskets. Open area of one basket shall be 2-1/2 times inlet or outlet piping area. Furnish on spare basket.

1. Strainers for Grooved Piping Systems:
    a) Y-Pattern Strainers: Ductile iron body ASTM A536 with coupling/cap and blowdown port bottom drain connection. Grooved ends 2”-18”. 304 SS perforated removable basket with .062” or .156” holes (depending on size) and start-up screen. 300 CWP. Victaulic Style 732/W732.
    b) T-Pattern Strainers: Ductile iron body ASTM A536 with coupling/cap or ASTM A53 carbon steel with T-bolt hinged closure/cap. Grooved ends 2”-24”. 304 SS

perforated removable basket with .042”-.126” holes (depending on size) and start-up screen. 300 CWP. Victaulic Style 730/W730.

C. Sleeves: Provide where piping passes through masonry or concrete walls, floors, roofs and partitions. Sleeves shall be placed during construction. Sleeves in outside walls below and above grade, in floor, or in roof slabs, shall be standard weight zinc coated steel pipe. Sleeves in partitions shall be zinc coated sheet steel having a nominal weight of not less than 0.90 pound per square foot. Space between piping and the sleeve shall be not less than 0.25 inch. Sleeves shall be of sufficient length to pass through entire thickness of walls, partitions or slabs.

2.12 PIPING INSTALLATION

A. Piping shall be inspected, tested and approved before being buried, covered or concealed. Horizontal piping shall be pitched with a minimum grade of one inch in 50 feet. Fittings shall be provided for changes in direction of piping, and for all connections. Fuel supply piping shall allow for ample tank movement and pipe expansion.

B. Install piping free from traps and drain toward tank.

C. Pipe Sleeves: Firmly pack space between the pipe or tubing, and sleeve with oakum and caulk on both ends of sleeve with elastic cement.

D. Unions, Flanges and Victaulic Couplings: Place unions, flanges or Victaulic couplings where necessary to permit easy disconnection of piping and apparatus. Each connection having a screw end valve shall have a union.

E. Valves: Install valves in positions accessible for operation and repair. Install check valve and an isolation valve on suction line of each fuel oil storage tank.

F. Field Testing: Upon completion and before final acceptance of the work, each system shall be tested as in service to demonstrate conformance with the contract requirements and in accordance with the requirements of ANSI B31.3 and NFPA 30.

G. Each new piping system will be hydrostatically tested at not less than 1.5 times the working pressure in accordance with ANSI B16.3, but in no case less than 200 psig and shall show no leakage or dials indicating not less than 1.5 times nor more than 2 times the test being placed in operation. Remove fuel quality monitor elements and water separator elements from filter separators before hydrostatic tests. Do not subject tank to pipe test pressures. Refer to tank manufacturers data for maximum test conditions.

H. Contractor shall provide one full tank load of fuel oil of the proper grade after successful testing.

I. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid or flexible, where required, grooved-end-pipe couplings. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. A Victaulic factory trained field representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

J. Piping which contains any fluid which could potentially freeze is strictly prohibited from being installed within areas which may be subject to freezing temperatures. If, during the installation process, it is noted that such piping will be located in an area subject to freezing temperatures it must be brought immediately to the attention of the engineer. If such an installation is unavoidable affected piping shall be provided with additional insulation as required by the energy code as well as heat tracing and associated power circuiting as required to avoid the fluid freezing.

2.13 PIPING INSULATION

A. Insulation

1. Hydronic/Steam Piping: Preformed glass fiber meeting ASTM C547, "k" value of 0.24 @ 75°F with all service jacket (ASJ). Service temperature 0°F to +850°F, 25/50.
2. Low Temperature Fluid Applications: Provide insulation with integral wick material. Product shall include a factory applied integral vapor retarder extending under the evaporator area of the wick and covering not less than 98% of the circumference of the product. Exposed evaporator area shall be not less than 0.1 sq. ft./linear ft. of product.
3. Plenum Return Applications: All insulation, jackets and accessories shall be rated for use in return air plenums.

B. Compliance: Insulation thickness, conductivity and installation shall comply with local Mechanical and Energy Codes.

C. Minimum Pipe Insulation:

1. Hot Water: 1-1/2” Thick, ≤ 1-1/2” Nominal Pipe Diameter
2. Hot Water: 2” Thick, > 1-1/2” Nominal Pipe Diameter
3. Chilled Water/Cold Condensate/Refrigerant: 1-1/2” Thick, ≤ 1-1/2” Nominal Pipe Diameter
4. Chilled Water/Cold Condensate/Refrigerant: 1-1/2” Thick, > 1-1/2” Nominal Pipe Diameter

FLUID	**NOMINAL PIPE DIAMETER**	
	≤1.5”	>1.5”
Hot Water	1 1/2"	2”
Chilled Water, Cold Condensate, or Refrigerant	1 1/2"	1 1/2"

D. Condensate Piping

1. All condensate piping, regardless of temperature, shall be provided with insulation.
2. Condensate generated by cooling coils shall be considered Low Temperature Fluid.

E. Fittings: Factory precut insulation inserts, thickness to be same as adjacent. Enclose in premolded, PVC fitting covers.

1. Low Temperature Applications: Fittings and valves shall be wrapped continuously with wicking material prior to installing insulation to ensure a continuous path for removal of condensation.

F. Jackets:

1. Interior: Factory applied, all service jacket of white Kraft bonded to aluminum foil reinforced with fiberglass yarn and suitable for painting. Longitudinal and butt joints shall be made with factory applied pressure sensitive material.
2. Exterior/Exposed (Low Temperature): Field applied, 20 mil, PVC sheet material.
3. Exterior/Exposed (High Temperature): Field applied, Aluminum sheet material.

4. All jackets exposed to the weather shall be reflective, UV resistant and sealed watertight.

G. Preparation

1. Install materials after piping has been tested and approved.

H. Installation

1. Install materials in strict accordance with manufacturer's instructions.
2. Continue all insulation through penetrations.
3. In piping exposed to view, locate insulation and cover seams in least visible locations.
4. On piping that requires condensation control, (i.e. chilled or cold) insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
5. On piping not requiring condensation control (i.e. steam, condensate hot water) do not insulate flanges and unions at equipment, but bevel and seal ends of insulation at such locations.
6. Provide pipe insulation with weatherproof jacket on exterior piping that has heat trace.

I. Supports:

1. All piping shall be supported in such a manner that the insulation is not compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that the circumferential joint may be made outside the hanger. Cover the evaporating holes with contractor supplied VaporWick Sealing Tape for the length of the metal saddle.
2. Piping systems 3" (75 mm) in diameter or less, insulated with fiberglass pipe insulation, may be supported by placing saddles of the proper length and spacing under the insulation as designated in Owens Corning Pub. 1-IN-14210.
3. For hot or cold piping systems larger than 3" (75 mm) in diameter, operating at temperatures less than +200F (93C) and insulated with fiberglass, inserts such as foam or high-density fiberglass with sufficient compressive strength shall be used to support the weight of the piping system.
4. On vertical runs, insulation support rings shall be used.

J. Accessories:

1. Insulation Bands: ¾ inch wide; 0.015 stainless steel
2. Metal Jacket Bands: ½ inch wide; 0.015 thick aluminum.
3. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.
4. Finishing Cement: ASTM C449.
5. Fibrous Glass Cloth: Untreated; 8oz/sq. yd. Weight.
6. Adhesives: Compatible with insulation.
7. Wick material for wrapping valves and fittings
8. Closure Materials –Sealing Tape, and mastics.
9. Support Materials - Hanger straps, hanger rods, saddles, support high-density blocks, and support rings.
10. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions, and/or in conformance with the current edition of "Commercial & Industrial Insulation Standards."

2.14 WATER TREATMENT

A. All hydronic HVAC systems shall be provided with water treatment chemicals during initial fill of the systems. Chemicals shall be designated for use in the specific system type and be provided in concentrations as recommended by the chemical manufacturer.

B. Where indicated on the drawings provide Propylene Glycol to hydronic systems in the concentrations indicated. Glycol shall be of the inhibited type and be provided with additional water treatment chemicals to prevent corrosion.

C. Hydronic systems shall be provided with a chemical shot feeder for the maintenance of water treatment chemicals.

D. Where Glycol Make-up systems are provided the contractor shall fill the tank with glycol solution at the completion of the project.

E. Contractor shall provide submittals for review and approval for all water treatment chemicals.

2.15 PIPING / EQUIPMENT LOCATED IN AREAS SUBJECT TO FREEZING

A. All piping subject to freezing shall be wrapped with heat trace cable, insulated as per specification and energy code, and in the case of drain piping, maintain a minimum continuous slope of 1%.

B. Where ceiling mounted equipment penetrates into an uninsulated attic space, it shall be covered with blanket insulation meeting minimum building code requirements and done in a manner complying with the equipment manufacturer’s recommendations.

2.16 FIRESTOPPING

A. Provide Firestopping systems for penetrations in fire-resistance-rated assemblies, including both membrane and through penetrations. This contractor shall thoroughly review architectural plans for assembly type and location and shall prepare bid accordingly.

B. Materials and systems shall be designed to meet the requirements of the intended application and shall be installed per manufacturer’s guidelines.

C. Submittals: Provide for review Manufacturer’s product literature and tested assembly for each type of fire protection material including product characteristics, typical uses, installation procedures, performance and limitation criteria.

2.17 DRIP PANS & LEAK DETECTION

A. Drip pans shall be provided where indicated on plans and under all new and existing piping within critical spaces.

B. Drip pans shall be constructed of continuously welded sheet metal. Each section shall be provided with a wire type leak detection sensor compatible with fluids present in piping. Leak detection alarms shall be tied back to Building Management System.

C. Provide new leak detection sensors in all existing drip pans. Tie alarms back to Building Management System.

2.18 SECONDARY DRAIN PANS

A. A secondary drain pan shall be provided under each piece of concealed (above ceilings, in closets, etc.) HVAC equipped which produces condensate.

B. The pan shall have a minimum depth of 1.5” and shall not be less than 3” larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion resistant material. Metallic pans shall have a minimum thickness of not less than 0.0276-inch galvanized sheet metal and non-metallic pans shall have a minimum thickness of not less than 0.0625 inch.

C. The secondary drain pan with a separate drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the drain pan at a higher level than the primary drain connection.

D. A secondary drain pan without a separate drain shall be equipped with water level detection device that will shut off the equipment served prior to overflow of the pan

PART 3: EXECUTION

3.1 OPERATING INSTRUCTIONS

A. Instruction to the Owner's Personnel - After completion of all work and all tests and at such times as designated by the Architect, provide the necessary skilled personnel to operate the entire installation until receipt of owners acceptance.

B. During the operating period, instruct the Owner's representative in the complete operation, adjustment, and maintenance of the entire installation.

C. Give at least forty-eight (48) hours advance notice to the Owner to coordinate scheduling of this instructional period.

D. Furnish to the Architect five (5) complete bound sets of typewritten or blueprinted instruction manuals for operating and maintaining all systems and equipment included in the contract. All instruction manuals shall be submitted in draft, for approval, prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instructions.

E. The above-mentioned instructions shall include the maintenance schedule for the principal items of equipment furnished under this contract.

3.2 MANUFACTURER'S RECOMMENDATIONS:

A. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

3.3 TESTING, ADJUSTING, STARTING UP AND COMMISSIONING

A. Testing: All work must be proved satisfactory. The tests herein specified shall be applied in the presence of, and to the satisfaction of, the Architect before the work is covered, concealed or made inaccessible to testing, repair, correction or replacement. Accommodate the testing operation to the progress of the project as a whole. Correct all defects appearing under test and repeat the tests until all parts of the work have been successfully tested. Apply the specific tests herein described. Present all work for acceptance in clean condition, properly adjusted and in good working order; for instance, all machinery must be quiet, well balanced, and must be in place and reading accurately. All systems, equipment, controls, and devices in this work shall be tested in operation and must prove for their purposes in the judgment of the Architect or his authorized representative. All internal surfaces of all lines and equipment shall be blown or flushed clean. Where pressure tests are specified, the apparatus shall be clean before the tests are applied. Contractor shall provide adequate protection of piping and duct systems to prevent vandalism and/or accidental damage, blockage, etc., that will hinder or prevent proper operation of the finished systems.

1. Provide instruments, pumps, gauges, supplies, equipment, materials, and labor for testing and starting up. Dispose of test water and wastes after test, in a manner approved by all applicable codes.

2. Perform tests which may be required by authorities or agencies in addition to those

herein specified.

3. Piping for hot water, chilled water, supply and return, drain, escape and relief valve discharge shall be tested with water and made tight under pressure of 150 pounds per square inch gauge maintained for one hour without pumping or as long as required to inspect all joints. Repair all leaks and retest. Piping shall be made tight without caulking. Apply pressure tests to piping only before connection of equipment. In no case shall piping, equipment or accessories be subjected to a pressure exceeding it's rating. Low-pressure elements shall be isolated or removed before tests are conducted.
4. Test valve bonnets for tightness. Test operate all valves at least once from closed-to-open-to-closed positions while valve is under pressure. Test all automatic valves for proper operation at the settings indicated. Test pressure relief valves at least three (3) times.
5. Test piping specialties for proper operation. Test air vent points to ensure that air has been vented.
6. Furnish certified shop test records for all pressure vessels. After installation, test at full operating pressures and temperatures maintained for one hour. Set and test all pressure control, relief and safety devices.
7. Repair or replace all defective work and repeat tests until the particular system and component parts thereof receive the approval of the Architect.
8. The duration of tests shall be as determined by authorities having jurisdiction, but in no case less than the time prescribed in each section of the specifications.
9. Test equipment and systems, which normally operate during seasons of the year during the appropriate season. Perform tests on individual equipment, systems and their controls. Whenever the equipment or system under test is interrelated with and depends upon the operation of other equipment, systems and controls for proper operation, function, and performance; the latter shall be operated simultaneously with the equipment of system being tested.

B. Adjusting, Balancing and Starting Up

1. Flush clean all systems prior to starting up the system. Any damages to the building or system components caused by failure to clean the systems properly shall be corrected to the satisfaction of the Architect or his authorized representative at no additional cost to the Owner.
2. In duct and piping systems, eliminate all noise and vibration and take all measures to secure proper circulation.
3. Run motor-driven equipment continuously for at least two hours in the presence of the Architect. Correct all defects of noise, vibration, alignment and balance. Replace all motors, which overheat or are noisy.
4. Balance systems completely for temperature, volume, and pressure per NEBB performance standards. Balancing subcontractor shall provide proof of certification by NEBB.
5. Air and water volumetric flow rates shall be within ten (10) percent of those specified. Air and water quantities and pressures shall be tested, balanced and recorded at all terminal devices. Volumetric flows and pressures shall be recorded on suitable forms and submitted for approval.
6. Provide any and all labor and equipment necessary to properly balance the installation including but not limited to dampers, valves, flow stations, test ports, sheaves, belts, etc.

7. All sequences of the system shall be checked and all temperature controls operated and commissioned as required to insure that all systems operate per Engineers intent.

C. Commissioning

1. This Contractor shall provide the deliverables to the engineer/owner.
2. Copies of all records shall be provided to the Engineer by this Contractor including, but not limited to:
    a) Equipment manuals including the name of at least one service agency;
    b) Testing and Balancing reports;
    c) Functional performance testing of the equipment, controls, economizers, and lighting control systems.
3. All commissioning shall be performed as indicated here and elsewhere in the specifications and shall comply with provisions of the applicable Energy Conservation Code.

3.4 SEQUENCE OF OPERATIONS

A. Sequence of Operations: This is a performance-based specification intended to convey the control intent of the various systems. The contractor shall provide detailed shop drawings including P&ID diagrams, equipment lists and finalized sequences for review by the Engineer prior to installation. Any questions concerning specific details shall be referred to the engineer for clarification.

B. System: It is the intent of this specification that a complete Building Management System (BMS) utilizing Direct Digital Control (DDC) be provided to control and monitor all HVAC systems within the facility.

C. System: It is the intent of this specification that all new systems and equipment be tied into the existing Building Management System (BMS) utilizing Direct Digital Control (DDC) to control and monitor all new HVAC systems within the facility. Contractor shall field coordinate BMS protocols and provide all required equipment, wiring, hardware, software, and programming to ensure full control of new equipment through the existing BMS.

D. System: It is the intent of this specification that programmable electronic controls be provided to control occupied/unoccupied modes of all HVAC systems within the facility. Systems shall be provided with all additional required controls including, but not limited to, space mounted monitoring and user interface devices, to provide the specified sequence.

E. Equipment and Wiring: This contractor shall provide all control equipment, and wiring (regardless of voltage) to accomplish the sequence of operations as detailed below. This contractor shall carry funds sufficient to hire the Electrical Contractor to provide line-voltage power, including any required wiring, breakers, and/or disconnects, to all control's components needing such power. Such components shall include, but may not be limited to:

1. Control Transformers
2. Central Equipment Controllers
3. BMS Controllers
4. Line-voltage Thermostats or other sensors

F. Control and Monitoring: Sensors shall be provided throughout the HVAC systems (hydronic and air) as required to control and monitor their operation and verify performance at BMS. Provide sensors with remote mounted stats where indicated on the drawings. Where multiple space mounted sensors are required for a given unit they shall be located in the same general area.

G. Safety Controls: This contractor shall provide all safety controls required to protect the building and all controlled equipment from damage as well as those controls necessary to signal abnormal operation or malfunction of equipment. These shall include but not be limited to high limits, low limits, freezestats, flow switches, interlocks and relays.

H. Energy Efficiency: All controls and sequences shall be configured to provide maximum energy efficiency while maintaining occupant comfort.

I. Functional Performance Testing: The contractor shall perform complete and thorough Control Functional Performance Test (FPT) and Commissioning of the control systems. Upon completion of the FPT, a report shall be submitted to the engineer for review and comment. The FPT shall include testing of:

1. Safeties in every mode, i.e., in manual run mode as well as auto mode.
2. Signals to and from the fire alarm, security and entry systems.
3. Sequences of operation step by step in every mode and possible situation.
4. The operation of all control loops under actual operating conditions.
5. The interlocked operation of all equipment (i.e., the operation of starters in manual and off modes as well as auto mode, damper end switch interlock, etc.)
6. Where the BAS performs computations, the actual computation of any formulas and simulation of actual conditions to check the BAS computations.
7. Review of BAS programs for errors and omissions.
8. Commissioning should test every conceivable life safety scenario and every conceivable operational scenario that the system will encounter and document this testing with printed graphs of trend logs.

J. Building Management System

1. System interface shall be web-based and accessible & adjustable from any web browser. System alarms and alerts shall be able to be programmed to be directed to a phone or email address.
2. System shall monitor all associated equipment & points in real-time.
3. System shall be capable of providing multiple occupancy schedules. Schedules shall be able to be programmed on a daily or monthly basis. Schedules shall allow for holidays. All schedules shall be able to be temporarily overridden at the request of the system operator though the web portal or at the space mounted user interface.
4. The following points shall be monitored by the BMS:
    a) Outside Air Temperature (DB/WB)
    b) Outside Air Relative Humidity
    c) Classrooms
    d) Conference Rooms
5. The BMS shall provide alerts for the following:
    a) Alarm/Trouble from any of the monitored systems
    b) Hot water supply temperature out of range
    c) Chilled water supply temperature out of range
    d) Loss of motor function and/or flow (all monitored equipment)
6. System shall communicate using open protocols (e.g. BACnet, Lonworks). Controls contractor shall be responsible for ensuring all equipment is capable of effectively

communicating with the BMS.

7. Refer to sequence of operations for additional information & requirements. All required fan & flow monitoring of belt drive systems shall be directly detected. Motor CTs shall not be accepted on belt drive equipment.
8. As a part of this contract, this contractor shall engage an electrical contractor to provide power and data wiring to all BMS controllers or other BMS system devices requiring the same.

K. Unit Ventilator Controls

1. Unit ventilator shall operate as primary source of cooling and heating within the room.
2. Occupied/Unoccupied Modes
    a) Unit ventilator controller will be commanded to occupied/unoccupied control via an adjustable time schedule residing in a network resident scheduling device. Space sensor provides an unoccupied override push button that allows occupied control for a period of time as set in controller.
3. Morning Warm-up Mode
    a) Morning warm-up mode will pre-start the unit vent in order to heat the space to occupied set point by the beginning of scheduled occupancy time. If space temperature as sensed at space temperature sensor is below occupied set point the damper will be positioned to full return air, hot water valve shall provide full flow to the coil, the face-and-bypass damper shall modulate to full-face, and the supply fan will start. When space temperature reaches occupied set point, warm-up mode will end and the unit vent will operate in normal occupied mode.
4. Occupied Mode
    a) When commanded to occupied mode, the supply fan will start and run continuously. When fan operation has been proven by the current switch, the outdoor air and return air dampers will modulate to introduce minimum outdoor air to the space and occupied control will be enabled. The face-and-bypass damper shall modulate to full bypass.
    b) Winter: If space temperature falls below occupied heating set point (adjustable) as sensed at space temperature sensor, the outdoor air damper will remain at minimum outdoor air position and the hot water valve will open, and the unit shall modulate its face-and-bypass damper to maintain the space temperature set point. As space temperature rises to set point, the hot water valve will modulate closed and the unit shall modulate to full bypass.
    c) Summer: If space temperature rises above occupied cooling set point (adjustable), the hot water valve will remain closed to the coil and the damper will modulate towards the full outdoor air position, as required, allowing outdoor air into the space. The damper function will be limited by the discharge air temperature sensor to prevent discharge air temperature from falling below 60°F (adjustable).
5. Unoccupied Mode
    a) Summer Standby: The supply fan will be off, the damper will be positioned to full return air and the hot water valve will be fully closed to the coil. The face-and-bypass damper shall be set to full face.

b) Winter Standby: The discharge air temperature sensor will modulate the hot water valve, as required, to maintain a minimum "warm box" temperature set point of 55°F (adjustable).

c) Winter: If space temperature falls below reduced night setback temperature heating set point (65°F adj.), the hot water valve will fully open and the supply fan will start. When space temperature rises to night setback temperature set point the supply fan will stop and the hot water valve will close to the coil.

d) Summer: If the outside air temperature drops 5°F (adj.) below the night setback cooling temperature (75°F adj.) the fan shall energize and the damper shall modulate towards the full outdoor air position. The hot water valve shall remain fully closed and the face-and-bypass damper shall modulate to the full bypass position. Once the thermostat is satisfied the unit shall return to standby.

6. Demand Ventilation Mode

a) If CO2 level rises above high limit set point of 900 PPM (adjustable), as sensed at space CO2 sensor, the damper function will be overridden and the outdoor air damper will modulate towards full open position, as required to maintain CO2 level below CO2 high limit set point. When CO2 level is maintained below high limit set point, normal control as described above will resume. The outdoor air function will be limited by the discharge air temperature sensor to prevent the discharge air temperature from falling below 50°F (adjustable).

7. Increased Ventilation Mode

a) Occupied Mode minimum outside air flow rates shall be increased to 2x (adj) the baseline minimum ventilation rate or the maximum scheduled ventilation rate, whichever is smaller.

b) Unoccupied Mode minimum outside air flow rates shall be set to 10% (adj) of the scheduled ventilation rate.

c) Increased ventilation mode shall be manually enabled/disabled at the BMS head end.

8. Safeties

a) Low Temperature Detection: Manual reset low limit thermostat, serpentined across the downstream side of the hot water coil, will stop the supply fan, position the damper to full return air, fully open the hot water valve, modulate the face-and-bypass damper to full bypass, and generate an alarm at the central operator's work station whenever the hot water coil discharge temperature is 38°F or below. When the low limit thermostat is manually reset, the alarm will be cancelled and normal control will resume.

9. Monitored Points

a) In addition to points required to properly execute the sequence of operations and safeties the following points shall be monitored:

(i) Discharge Air Temperature (°F)

(ii) Space Temperature (°F)

(iii) Fan Status (On/Off)

(iv) Face and Bypass Damper Position (% face)

(v) OA Damper Position (% open)

b) Controls contractor shall coordinate with UV manufacturer regarding the furnishing and installation of all required sensors, actuators, and controller.

L. Fan Coil Controls

1. Unit ventilator shall operate as primary source of cooling and heating within room.
2. Occupied/Unoccupied Modes
    a) The Fan coil controller will be commanded to occupied/unoccupied control via an adjustable time schedule residing in a network resident scheduling device. Space sensor provides an unoccupied override push button that allows occupied control for a period of time as set in controller.
3. Morning Warm-up Mode
    a) Morning warm-up mode will pre-start the unit vent in order to heat the space to occupied set point by the beginning of scheduled occupancy time. If space temperature as sensed at space temperature sensor is below occupied set point the damper will be positioned to full return air, hot water valve shall provide full flow to the coil, When space temperature reaches occupied set point, warm-up mode will end and the unit vent will operate in normal occupied mode.
4. Occupied Mode
    a) The supply fan will start and run continuously. When fan operation has been proven by the current switch, the outdoor air dampers will modulate to introduce minimum outdoor air to the space and occupied control will be enabled.
    b) Winter: If space temperature falls below occupied heating set point (adjustable) as sensed at space temperature sensor, the outdoor air damper will remain at minimum outdoor air position and the hot water valve will open, and the unit shall modulate the space temperature set point. As space temperature rises to set point, the hot water valve will modulate closed and the unit shall modulate to full bypass.
    c) Summer: If space temperature rises above occupied cooling set point (adjustable), the hot water valve will remain closed to the coil and the damper will modulate towards the full outdoor air position, as required, allowing outdoor air into the space.
5. Unoccupied Mode
    a) Summer Standby: The supply fan will be operate, the damper will be positioned to full return air and the hot water valve will be fully closed to the coil.
    b) Winter Standby: The discharge air temperature sensor will modulate the hot water valve, as required, to maintain a minimum “warm box” temperature set point of 55°F (adjustable).

c) Winter: If space temperature falls below reduced night setback temperature heating set point (65°F adj.), the hot water valve will fully open. When space temperature rises to night setback temperature set point the and the hot water valve will close to the coil.

d) Summer: If the outside air temperature drops 5°F (adj.) below the night setback cooling temperature (75°F adj.) the damper shall modulate towards the full outdoor air position. The hot water valve shall remain fully closed.

6. Safeties

a) Low Temperature Detection: Manual reset low limit thermostat, serpentined across the downstream side of the hot water coil, will stop the supply fan, position the damper to full return air, fully open the hot water valve, modulate the face-and-bypass damper to full bypass, and generate an alarm at the central operator's work station whenever the hot water coil discharge temperature is 38°F or below. When the low limit thermostat is manually reset, the alarm will be cancelled and normal control will resume.

7. Monitored Points

a) In addition to points required to properly execute the sequence of operations and safeties the following points shall be monitored:

(i) Discharge Air Temperature (°F)

(ii) Space Temperature (°F)

(iii) Fan Status (On/Off)

(iv) OA Damper Position (% open)

b) Controls contractor shall coordinate with fan coil manufacturer regarding the furnishing and installation of all required sensors, actuators, and controller.

M. Exhaust Fans:

1. CEF-1 & CEF-3 to be interlocked with light switches.
2. CEF-2 shall operate continuously.

END OF SECTION

SECTION 26 00 00 ELECTRICAL

PART 1 – GENERAL

1.1 RELATED SECTIONS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.
B. This Contractor shall also include allowances for startup and for making the systems fully operational, and for scope and design contingencies. Future changes in price for items not shown on these drawings will not be allowed if the system itself is shown on these Drawings.
C. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.
D. The drawings show the layout of the electrical systems and indicate the approximate locations of outlets, apparatus, and equipment. The runs of feeders and branches as shown on the drawings are schematic only. The exact routing of branch circuits and feeders shall be determined by the structural conditions and possible obstructions. This shall not be construed to mean that the design of the systems may be changed but refers only to exact runs between given points. The Engineer reserves the right to revise the drawings from time to time to indicate changes in the work.
E. The Contractor shall consult and review all contract and reference drawings which may affect the location of any outlets, apparatus and equipment to avoid any possible interference and permit full location of outlets, apparatus and equipment up to the time of rough-in is reserved by the Engineer and such change shall be made without additional expense to the Owner.
F. It shall be the responsibility of this Contractor to see that all electrical equipment such as junction and pull boxes, panelboards switches, controls and such other apparatus as may require maintenance and operation from time to time is made accessible. Although the equipment may be shown on the drawings in certain locations, the construction may disclose the fact that such locations do make its position accessible. In such cases this Contractor shall call the attention of the Engineer to the condition before advancing the construction to a state where a change will reflect additional expense to the Owner.

1.2 SUMMARY

A. This Section specifies the basic requirements for electrical installations and includes requirements common to more than one section of Division 26. It expands and supplements the requirements specified in sections of Division 1.
B. These documents have been prepared with the intention that they call for finished, tested work, in full operating condition and complete with necessary accessories.
C. The contract drawings are generally diagrammatic and convey the scope of work and general arrangement of apparatus and equipment. The locations of all items shown on the drawings or called for in the specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project and shall have the approval of the Architect/Engineer before being installed. The Contractor shall follow the drawings in laying out work and shall check drawings of the other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. If directed by the General Contractor, Engineer and/or Architect, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.
D. These contract documents are complementary. What is called for by one shall be as binding as if called for by all. Materials or work described in words, which have well-known technical, or trade meaning shall be held to refer to such recognized standards. Incidental devices and accessories needed for

complete, operational systems shall be provided even though they may not be indicated or identified in the documents.

E. If apparatus have been omitted, notify the Architects/Engineers of such belief. It is understood that bidder has included all required items and work in his bid, and will not if bid is successful, claim extra compensation for furnishing a complete and satisfactory system. If a particular item is called for or specified more than once in these contract documents, the higher grade shall be considered specified.
F. Should it appear that the character of the work is not sufficiently explained in these specifications or on the drawings, apply to the A/E for further information. Conform to the A/E's decision and directions as shall become part of these contract documents. The A/E reserves the right to be sole interpreter of the drawings and specifications, and all decisions shall be conclusive, final and binding on the parties.
G. Materials called for in these documents shall be new, unused equipment and of the latest recognized standards.
H. The work to be done under Division 16 is shown on the electrical drawings.

1.3 OUTLINE SCOPE OF WORK

A. The work under this contract, without limiting the generality thereof, includes all materials, labor, equipment, services, and transportation, unless otherwise specified, necessary to complete all systems of electrical wiring and equipment required by the drawings and/or as specified herein. It is the intent of this section and accompanying electrical drawings that these systems be furnished complete in every respect. The Electrical Contractor shall furnish all wiring, equipment and labor needed for a complete operating installation.
B. The Electrical Contractor shall fully indemnify the Owner against any damages, removals and alteration work. This is in addition to the requirements of the General Conditions of the Specifications.
C. The Electrical Contractor shall review architectural, interior design and all other trades plans, elevations and details prior to any work and identify any conflicts between furnishings, furniture, art-work, molding, casework, televisions, signage, awnings, canopies, diffusers, fixtures, etc.. and electrical, fire alarm, audio/visual and communications devices shown on the electrical plans and details. The Electrical Contractor shall prepare 8.5” x 11” sketches showing the conflicts and submit to the Architect for resolution prior to any work. Failure of the electrical contractor to coordinate, identify and obtain a field-directive on any conflict herein noted, that results in installed electrical work to be relocated to the Owner/Architects liking shall be the sole-responsibility of the Electrical Contractor. The Electrical Contractor shall assume and cover all costs associated with conflicts not coordinated, identified and submitted to the Architect, inclusive of material, labor, overtime pay, etc.. and shall not affect the project schedule.

1.4 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
B. Refer to equipment specifications in Divisions 2 through 25 for rough-in requirements.

1.5 SURVEYS AND MEASUREMENTS

A. Base measurements, both horizontal and vertical, on established bench marks. Work shall agree with these established lines and levels. Verify measurements at site and check the corrections of same as related to the work.
B. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, he shall notify the A/E.

1.6 EXAMINATION OF SITE

A. Prior to submitting bid, visit the site where the work is to be performed and the materials are to be delivered. Failure in this respect shall not excuse the Contractor from his obligation to supply and install the work in accordance with the plans and specifications and under all conditions, as they exist.
B. By submitting a bid, this Contractor warrants that all specification sections and drawings showing equipment for plumbing, heating, ventilation, air conditioning, electrical, and architectural, have been examined and is familiar with the conditions and extent of work affecting this contract.

1.7 EQUIPMENT AND MATERIALS

A. All equipment and materials for permanent installation shall be the products of recognized manufacturer's and shall be new, unless noted for re-use, without damaged, functional or aesthetic components.
B. New equipment and materials shall:
    1. Be Underwriters Laboratories, Inc. (UL) labeled and/or listed where specifically called for, or where normally subject to such UL labeling and/or listing services
    2. Be without blemish or defect.
    3. Be in accordance with the latest applicable NEMA standards.
    4. Be products, which will meet with the acceptance of the agency inspecting the electrical work. Where such acceptance is contingent upon having the products examined, tested and certified by UL or other recognized testing laboratory, the product shall be so examined, tested and certified.
C. For all equipment, which is to be installed but not purchased as part of the electrical work, the electrical work shall include:
    1. The coordination of their delivery.
    2. Their unloading from delivery trucks driven in to any point on the property line at grade level.
    3. Their safe handling and field storage up to the time of permanent placement in the project.
    4. The correction of any damage, defacement or corrosion to which they may have been subjected.
    5. Their field make-up and internal wiring as may be necessary for their proper operation.
    6. Their mounting in place, including the purchase and installation of all dunnage, supporting members and fastenings necessary to adapt them to architectural and structural conditions.
D. Equipment, which is to be installed but not purchased as part of the electrical work, shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.8 ELECTRICAL INSTALLATIONS

A. All materials and labor called for, specified in Division 16 of the specifications, and or shown on the electrical drawings furnished under this contract shall be provided under Division 16 unless called for otherwise in the Division 16 documents. The word “provide” as used in the Division 16 documents, shall mean to furnish, install, connect up, complete with all accessories ready for operation and warranted.
B. Coordinate electrical equipment and materials installation with other building components. Fully coordinate work with that of other trades. Furnish information in writing that is needed for the coordination of clearances, etc., with the work of others, and such information shall be given in a timely fashion so as not to impede the progress of two or more trades. Confer and resolve the conflict immediately. If so directed by the A/E, prepare composite drawings to resolve any space or clearance conflict.
C. Verify all dimensions by field measurements.
D. Arrange for chases, slots, and openings in other building components to allow for electrical installations.

E. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
F. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
G. Coordinate the cutting and patching of building components to accommodate the installation of electrical equipment and materials.
H. Where mounting heights are not detailed or dimensioned, the exact location shall be determined by the A/E, install electrical services and overhead equipment to provide the code and/or utility requirements.
I. Install electrical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
J. Coordinate the installation of electrical materials and equipment above ceilings with suspension systems, mechanical equipment and systems, and structural components.
K. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
L. Attention is directed to areas and items indicated on the drawings by the notations "HOLD", "N.I.C.", "BY OTHERS" and words of similar intent. The work indicated in these areas is shown for information and continuity only. Work or items furnished and installed in these areas solely for the convenience of this Contractor or others, without prior written approval of the Owner, shall be removed at the option of the Owner and at the Contractor's expense.
M. Provide all required staging and scaffolding for all the work under this section.

1.9 ALTERATION WORK

A. Maintain continuity of service in areas where occupancy is to be maintained during alterations. If it becomes necessary to disconnect or interrupt service, obtain written consent of the Owner, and only disconnect service at the convenience of, and with the consent of the Owner. A copy of the written request for a shutdown shall be forwarded to the A/E.

1.10 CUTTING AND PATCHING

A. Cutting and patching of electrical equipment, components, and materials specified under Division 16 (conduit, sleeves, equipment, etc.) shall be performed by Electrical Contractor.
B. Refer to the Conditions of the Contract (General and Supplementary) and Division 1 Section: "Cutting and Patching" for definitions, requirements, and procedures.
C. Cutting and patching of existing structures (thru walls, floors, ceilings, etc.) to accommodate equipment, components, and materials of all Contractors, including Mechanical and Electrical Contractors, shall be performed by General Contractor and/or his designated Subcontractor.
D. Cutting and patching of new structures (thru walls, floors, ceilings, etc.) to accommodate installation of ill-timed work or removal and replacement of defective work or work not conforming to requirements of Contract Documents, shall be performed by General Contractor and/or his designated Subcontractor and costs shall be back charged to appropriate trade Contractor.
E. Do not endanger or damage installed work through procedures and processes of cutting and patching.
F. Arrange for repairs required to restore other work, because of damage caused as a result of electrical installations.
G. Arrange to have ducts, raceways, conduit, panelboards, boxes, and such other pertinent parts, set in place ahead of construction work so that they will be built-in with structures and eliminate need for cutting and patching. Failure to conform to this paragraph will require that this Contractor perform any cutting and patching required for his work at his expense. Cutting shall be neatly finished to match adjoining work in a manner acceptable to the A/E. Cutting and patching shall not affect the fire rating of walls or structural parts. Cutting and patching required to correct work, due to error or negligence of the Contractor, or to defects in his material or workmanship, shall be corrected at no additional cost to

the Owner. Patching shall meet or exceed quality of adjacent surfaces. Cutting must be accomplished as not to weaken adjacent structural members and must be approved by the Structural Engineer before proceeding.

H. Perform cutting, fitting, and patching of electrical equipment and material required to:
    1. Uncover work to provide for installation of ill-timed work.
    2. Remove and replace defective work.
    3. Remove and replace work not conforming to requirements of the contract documents.
    4. Remove samples of installed work as specified for testing.
    5. Install equipment and materials in existing structures.
    6. Upon written instructions from the A/E, uncover and restore work to provide for A/E observation of concealed work.

I. Cut, remove and legally dispose of selected electrical equipment, components and materials as indicated, including, but not limited to, removal of electrical items indicated to be removed and items made obsolete by the work.

J. Protect the structure, furnishing, finishes, and adjacent materials not indicated or scheduled to be removed. Protect the electrical work and the work of others in a manner best suited to the particular case. Correct any damage done to any work at no additional cost.

K. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

L. Locate, identify, and protect electrical services passing through areas that are to under-go remodeling or demolition. Electrical services serving other areas required to be maintained, and transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to changeover.

1.11 SUBMITTALS

A. Within fifteen (15) business days after the date of notice to proceed and before purchasing any materials or equipment, submit for approval a complete list, in six (6) copies, of all materials to be incorporated in the work.

B. Shop drawings/manufacturer's cuts are required for:
    1. Wire & Cable.
    2. Lighting Fixtures.
    3. Panelboards.
    4. Transformers.
    5. Disconnect Switches.
    6. Fire Alarm System.
    7. Wiring Devices and Plates.
    8. Fire Stopping Materials.
    9. Seismic Restraint Components.

C. After the list has been processed, submit complete shop drawings of all equipment. These shop drawings submittals shall be submitted within thirty days after the processing date of the original submittal.

D. All submittals shall be complete and submitted electronically to all applicable parties. No consideration will be given to partial submittals except with prior approval. No consideration will be given to faxed submittals.

E. Explanation of Shop Drawing Stamp:
    1. Approved: indicates that we have not found any reason why this item should not be acceptable within the intent of the documents.
    2. Approved with Comments: indicates that we have found questionable components which, if corrected or otherwise explained, make the product acceptable.
    3. Resubmit for Final Review: indicates that this item should be resubmitted for approval before further processing.
    4. Does Not Conform: indicates that the item will not meet the intent of the Contract.

F. No shop drawing stamp or note shall constitute an order to fabricate or ship. Such notification can only be performed by the Project Manager for construction, the Contractor scheduling his own work, or the Owner.
G. Submittal of shop drawings, product data, will be reviewed only when submitted by the Contractor. Data submitted from Sub-contractors and material suppliers directly to the A/E will not be processed.
H. If shop drawing is not in compliance after two submissions, a third submission for the same manufacturer will not be considered for review.
I. Check shop drawings and other submittals to assure compliance with contract documents before submittal to A/E.
J. Review of shop drawings is final and no further changes shall be considered without written application. Shop drawing review does not apply to quantities, dimensions, nor relieve this Contractor of his responsibility for furnishing materials or performing his work in full compliance with these contract drawings and specifications. Review of these shop drawings shall not be considered a guarantee of the measurements of this building or the conditions encountered.
K. General requirements for the substitution of equipment and submittal of shop drawings as follows. If apparatus, systems or materials are substituted for those specified, and such substitution necessitates changes in, or additional connections, wiring, supports, or construction, it shall be provided by this Contractor at no additional cost to the Owner. This Contractor shall assume all cost and entire responsibility thereof. The approval of substituted equipment does not relieve the contractor of his/her responsibility of shop drawing errors related to details, sizes, quantities, wiring diagram arrangements and dimensions which deviate from the Specifications, and/or job conditions as they exist. It is the contractor's responsibility to submit only those items that meet the specified apparatus, systems and material. Should any non-conformance code items be installed, they shall be replaced by this Contractor at no additional cost to the Owner. The construction means and methods used in the project shall be reviewed and approved through the local building department or a deputy inspector to insure compliance with the current codes, project specifications and general building practices.
L. Coordination drawings shall be submitted and shall show all HVAC, Electrical, Plumbing and Fire Protection systems superimposed in order to identify conflicts and ensure inter-coordination of all trades. Coordination drawings shall be initiated under this Section of the Specifications. It is this Contractors responsibility for preparation of project coordination drawings showing the installation of all electrical equipment, switchgear, motor control centers, panelboards, transformers, transfer switches, disconnect switches, enclosed circuit breakers, conduits, outlets, switches and accessories to be provided under this Section of the Specifications. These drawings shall be prepared at not less than 3/8 in. = 1 ft. scale, and shall show building room layouts, structural elements, ductwork and lighting layouts of function. A reproducible copy of each drawing prepared shall then be submitted to the Mechanical, Plumbing and Sprinkler Contractors, who shall be responsible to coordinate his equipment and systems and shall show these on the drawings submitted. After this Contractor has fulfilled his obligation, he shall notify all other Contractors. After each drawing has been coordinated between trades, each trade shall sign each drawing, indicating acceptance of the installation. This Contractor shall then print the coordination original and these prints submitted through the General Contractor to the architect for review and comment, similar to shop drawings. Comments made on these drawings shall result in a correction and re-submittal of the drawings. A Subcontractor who fails to promptly review and incorporate his work on the drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications. Review of coordination drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

1.12 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Refer to the Conditions of the Contract (General and Supplementary) and Division 1 for definitions, requirements, and procedures.
B. If materials of equipment are substituted for specified items that alter the systems shown or its physical characteristics, or which have different operating characteristics, clearly note the alterations or

differences and call it to the attention of the A/E. Under no circumstances shall substitutions be made unless identical material or equipment has been successfully operated for at least three consecutive years.

C. All substitution made by the Contractor shall require the Contractor to fully coordinate the substitution with other trades. The Contractor must make any modifications required by the substitution at no additional cost to the Owner. In addition the Contractor must notify the A/E of any changes required and obtain approval for the changes. The review of the shop drawings by the A/E shall not relieve the Contractor from his responsibility as set forth in this specification.

1.13 NAMEPLATE DATA

A. Provide permanent operational data nameplate on each item of power operated equipment, conduits with pull string, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in a readily accessible location.

1.14 DELIVERY STORAGE AND HANDLING

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage. All devices shall be stored in a locked room. Assume responsibility for the devices until the date of final inspection.
C. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.15 RECORD DOCUMENTS

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.
B. At completion of work prepare a complete set of Record As-Built Drawings in AutoCAD, Computer Aided Drafting (CAD) software, showing all systems as actually installed, including all fire alarm and electrical circuitry. The Record As-Built Drawings computer files shall be made available to the Architect, Engineer and Owner prior to final payment.
C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Electrical Contractor.
D. This trade shall submit the record set for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.
E. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.16 WARRANTIES

A. Refer to the Conditions of the Contract (General and Supplementary) and Division 1 for definitions, requirements, and procedures.
B. All work and equipment furnished under this Section shall be guaranteed free from defects in workmanship or materials for a period of one (1) year, unless specifically noted otherwise for a particular system, from the date of final acceptance of the systems as set forth in this Contract. The Subcontractor shall replace any defective work developing during this period, unless such defects are clearly the result of misuse of equipment by persons not under the control of the Subcontractor, without cost to the Owner. Where such defective work results in damage to work of other Sections, all such work shall be restored to its original condition by mechanics skilled in the affected trade, at the expense of the Subcontractor. The Subcontractor shall submit a separate written guarantee stipulating the aforesaid conditions.
C. Prior to or at the time of Substantial Completion for the work and during administrative close-out of the project, submit one (1) copy of all specified warranties and guarantees to the Architect for review, approval and subsequent transmittal to the Owner.
D. Warranties and guarantees, including those specified in excess of the general one (1) year guarantee, shall be complete for all specific materials, systems, sub-systems, equipment, appliances and products specified and required by the Contract Document.
E. Warranties and guarantees shall clearly define what is to be guaranteed; the extent, terms, conditions, time and effective dates.
F. Copies of the same warranties and guarantees shall be included in the “Operating and Maintenance Manual” as specified herein.

1.17 CLEANING

A. Refer to the Conditions of the Contract (General and Supplementary) and Division 1 for definitions, requirements, and procedures.
B. Upon completion of work, the Contractor shall clean, polish and leave bright, fixtures and lamps, and shall remove dust, dirt, debris and loose plaster from panelboards, controls, and switchboards. Unused openings in pull boxes, junction boxes, equipment and raceways shall be capped or closed by an approved means. Replace all inoperative lamps.

1.18 DEFINITION OF TERMS

A. "This Contractor" or "E.C." specifically means, the Electrical Contractor working under this section of the specifications.
B. "Concealed" means hidden, in chases, furred spaces, walls, above ceilings or enclosed in construction.
C. "Exposed" means visible in sight or not installed "concealed" as defined above.
D. "Approved Equal" means any equipment or material which is approved by the Engineer and equal in quality, durability, appearance, strength, design and performance to the equipment or material originally specified.
E. "Conduit" shall mean all conduit including fittings, joints, hangers and supports.
F. "Furnish" shall mean to purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the electrical work.
G. "Install" shall mean to perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the electrical work.
H. "Provide" shall mean to furnish and install.

1.19 QUALITY ASSURANCE

A. Obtain services of manufacturer's representatives of electrical equipment, during erection and construction of their respective equipment to insure proper installation of same.
B. A letter is required from each system manufacturer's representative certifying to the A/E that requirements have been checked and are properly installed and operating.

1.20 PERFORMANCE TESTS - ELECTRICAL

A. Test and adjust the electrical systems and equipment during the progress of the work.
B. Upon completion of work and after preliminary tests to assure that all systems are complete and in proper working order, arrange with the A/E to conduct performance tests of the electrical systems. These tests may be witnessed by the A/E prior to acceptance of systems and shall be arranged for the purpose of demonstrating compliance with contract documents. During this period, visually inspect all electrical equipment. Lighting fixtures shall be tested with specified lamps in place for not less than six (6) hours. Check voltages to assure that all transformer taps are properly set.
C. General operating tests shall be performed under as near design conditions as possible, for a period of not less than one (1) hour for each system, and shall demonstrate that all equipment is functioning in accordance with specifications. Furnish all instruments, ladders, test equipment and personnel required for tests. Any equipment or systems found by test to be deficient or unsatisfactory shall be replaced and tests repeated as often as necessary to assure compliance with contract documents.
D. Test all feeders, sub-feeders and all branch wiring for amperage, voltage, phase balance, phase sequence of A,B,C and insulation resistance, then submit the results of this test to the A/E neatly typed in triplicate for review. This test may be conducted at any time up to, through and including, the guarantee period if requested by the A/E, at no additional cost to the Owner.
E. Phase balance the complete electrical system, phase balance all panels as near as loads will permit under normal working conditions.
F. Test all ground conductors for current flow, as near design operating conditions as possible. If any measured current exceeds one (1) ampere, determine and correct the cause. Also, if measured resistance is greater than 5 ohms indoor or 10 ohms outdoor, determine and correct the cause.
G. During the progress or completion of the work it shall be subject to the inspection of the Owner and to such other inspectors, as may have jurisdiction, including those of the Electric Company, Fire Department and the Telephone Company.
H. The Contractor shall be responsible for correct voltages, tap settings, trip settings and correct phasing on all equipment. Secondary voltages shall be measured at the line side of the main breakers with the breakers in an open position, at panelboards, and at such other location on the distribution systems and branch circuits as directed by the Engineer.
I. At completion of the work, Contractor shall submit to the Owner's representative in writing a statement stating: (1) that the work is complete; (2) that the entire installation is in accordance with the drawings and specifications; (3) that preliminary tests have been made; and (4) that the work is ready for final inspection and test.
J. A final inspection of the installation to determine compliance with the drawings and specifications will be made by the Owner's representative. Work will be checked for quality of materials, quality of workmanship, proper installation and finished appearance. The electrical contractor shall provide the services of the project electrical foreman for inspection purposes. The foreman shall remove and reinstall wiring devices, junction box covers, panelboard trims, switchboard covers, terminal box covers, ceiling tiles, lighting fixtures, etc. as required to facilitate any inspections required by the Owner's representative.
K. The Contractor shall arrange and conduct operating tests on all equipment in the presence of the Owner's representative. The components parts of systems and the various systems shall be demonstrated to operate in accordance with the requirements and intent of this specification. Any non-complying or defective materials or workmanship disclosed as a result of the inspection and tests shall be corrected promptly by the Contractor, and the tests repeated as often as necessary until approved and accepted by the Owner's representative.
L. The Contractor shall visit the site to acquaint himself with existing conditions. No extra compensation will be paid for failure to comply with this paragraph.
M. The Electrical Contractor shall provide supervision, labor, materials, tools, test equipment, and all other equipment or services and expenses required to test, adjust, set, calibrate, and operationally check work and components of the electrical systems and circuitry throughout this section.
N. The electrical contractor shall pay for all tests including expences incident to retests occasioned by defects and failures of equipment to meet specifications at no additional cost to the owner.

O. Any defects or deficiencies discovered in any of the electrical work shall be corrected at no cost to the owner.
P. All testing shall be compatible with the manufacturer's installation instructions.

1.21 SEISMIC RESTRAINT

A. It is the intent of this seismic specification to keep all electrical building system components in place during a seismic event.
B. All electrical systems must be installed in strict accordance with seismic codes, component manufacturer's and building construction standards. Whenever a Conflict occurs between the manufacturer's or construction standards, the most stringent shall apply.
C. This contractor shall engage a professional structural engineer registered in the jurisdiction of this project to review the entire installation to determine all seismic restraint requirements and methods. Contractor shall submit a report outlining the structural engineer's review as well as seismic restraint shop drawings and supporting calculations prepared by the professional structural engineer for review by the Architect.
D. Seismic restraints shall be designed in accordance with seismic force levels as detailed in the applicable building code.

1.22 TEMPORARY LIGHT AND POWER

A. Under this Section of the specifications, this Contractor shall provide temporary electric service, sized suitable for construction for each trade. This contractor shall provide all material and labor for temporary electrical service per the local power company's requirements and standards with all necessary panelboards, disconnect switches, transformers, conduit, wiring, etc. as required. This contractor shall pay all associated costs, up front.
B. Where temporary electrical service cannot be obtained from the local power company, this contractor shall provide a temporary, on-site, electric generator with all necessary panelboards, disconnect switches, transformers, conduit, wiring, etc. as required. The fuel used for the generator shall be provided and paid for by this Contractor.
C. This contractor shall provide a distribution system with circuits for receptacles and lighting as required for construction. This contractor shall maintain the temporary electrical system during construction and remove the system when construction is complete.
D. Under this section of the specifications, this Contractor shall provide and maintain temporary lighting based on using not less than one 100-watt lamp for each 100 square feet of building floor area and one duplex GFCI receptacle for each 200 square feet of building floor area. Where higher lighting intensities are required by Federal or State laws or otherwise specified, the above specified wattage shall be increased to provide the increase intensities.
E. This contactor shall provide temporary power and telephone services from the local telephone company for site trailers, fax machines, computers, etc., per the general contractor's direction.
F. The service shall incorporate ground fault protection and comply with NEC Article 527 and OSHA requirements.

1.23 PERMITS

A. Obtain all required electrical permits and pay all fees for same.
B. Provide to Engineer, in duplicate, a certificate of final inspection from the authority having jurisdiction for the electrical and systems.

1.24 OPERATING, INSTRUCTION, AND MAINTAINANCE MANUALS

A. Refer to Section 01700 – CONTRACT CLOSEOUT for submittal procedures pertaining to operating and maintenance manuals.

B. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed.

1.25 BIDDERS REPRESENTATION

A. By the act of submitting a bid for the proposed contract, the Bidder represents that:
   1. The Bidder and all subcontractors the Bidder intends to use have carefully and thoroughly reviewed the drawings, specifications and other construction contract documents and have found them complete and free from ambiguities and sufficient for the purpose intended; further that,
   2. The Bidder and workmen, employees and subcontractors the Bidder intends to use are skilled and experienced in the type of construction represented by the construction contract documents bid upon; further that,
   3. Neither the Bidder nor any of the Bidder's employees, agents, intended suppliers or subcontractors have relied upon any verbal representations, allegedly authorized or unauthorized from the Owner, or the Owner's employees or agents including architects, engineers or consultants, in assembling the bid figure; and further that,
   4. The bid figure is based solely upon the construction contract documents and properly issued written addenda and not upon any other written representation.

1.26 UTILITY COMPANY & AGENCY COORDINATION

A. This section includes, but is not limited to coordination with the following utilities, agencies and authorities having jurisdiction:
   1. Local Fire Marshal: This contractor shall verify with the local fire alarm official, the type of master-box or municipal connection required for this project. This contractor shall provide all material & labor to comply with the local municipality. Notify Engineer of discrepancies between the plans and the municipality's standards. No extra compensation will be given for corrections required for failure to coordinate with the municipality, but corrections shall be made.
   2. Electrical Inspector: Review plans and specifications with the local electrical and/or wiring inspector(s). Obtain and pay for all permits.
   3. Building Inspector: Review plans and specifications with the local building inspector, if not done so by the General Contractor.
   4. OSHA Representative: Review plans and specifications with the local OSHA representative, if not done so by the General Contractor.
   5. Dig Safe: This contractor shall notify and coordinate with Dig Safe prior to any excavation; digging; trenching; grading; tunneling; augering; boring; drilling; pile driving; plowing-in or pulling-in pipe, cable, wire, conduit, or other sub-structure; backfilling; demolition; and blasting related to this Contractor.
B. The Electrical Contractor shall pay for all permits, inspections, labor, material and fees associated with the various Utility Companies coordination requirements mentioned in this section and for this Contractor's work under this project.
C. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structural and other trades and to meet Architectural requirements.
D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the electrical work shall interfere with the work of other trades, assist in working out the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owners, make reasonable modifications to the work as required by normal structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through

concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.

E. If any electrical work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the trades involved without extra cost to the Owners.

F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect and Engineer for review and approval.

PART 2 – PRODUCTS

2.1 CONDUIT

A. Minimum Size: ¾-inch, unless otherwise specified.

B. Underground Installations:
   1. More than Five Feet from Foundation Wall: Use thick wall nonmetallic conduit concrete encased.
   2. Within Five Feet from Foundation Wall: Use rigid steel conduit concrete encased.
   3. In or Under Slab on Grade: Use plastic coated conduit.
   4. Minimum Size: 1-inch.

C. Outdoor Locations, Above Grade: Use rigid steel conduit.

D. In Slab Above Grade:
   1. Use rigid steel conduit.
   2. Maximum Size Conduit in Slab: ¾ inch (19 mm); ½ inch (13 mm) for conduits crossing each other.

E. Wet and Damp Locations: Use rigid aluminum conduit.

F. Dry Locations:
   1. Concealed and in Cable-Tray: Use metal clad (MC) cable (see Division 1)
   2. Exposed: (Unfinished or utility spaces) Use electrical metallic tubing.

G. Metal conduit: Rigid Steel Conduit shall comply with ANSI C80.1 and be heavy wall zinc coated steel. Rigid Aluminum Conduit shall comply with ANSI C80.5. Intermediate Metal Conduit (IMC) shall be rigid steel. Fittings and Conduit Bodies shall comply with ANSI/NEMA FB 1 and material to match conduit. Acceptable manufacturers are Western Tube and Conduit Company, Allied Tube and Conduit Company and Triangle Wire and Cable, Inc.

H. Flexible metal conduit shall be interlocked aluminum contruction. Fittings shall comply with ANSI/NEMA FB 1. Acceptable manufacturers are AFC Cable Systems, Electri-Flex Company and Eastern Flexible Conduit Technologies. All flexible conduits shall include a grounding conductor.

I. Electrical metallic tubing (EMT) shall comply with ANSI C80.3; galvanized zinc coated steel tubing. Fittings and Conduit Bodies shall comply with ANSI/NEMA FB 1; steel, compression or set screw type. Acceptable manufacturers are Western Tube and Conduit Company, Allied Tube and Conduit Company and Triangle Wire and Cable, Inc.

J. Nonmetal conduit shall comply with NEMA TC 2; Schedule 40 PVC, or as indicated on plans. Fittings and Conduit Bodies shall comply with NEMA TC 3. Acceptable manufacturers are Carlon or approved equal.

K. Flexible nonmetallic conduit (Sealtite) shall be UL and CSA listed for purpose specified and shown. Acceptable manufacturers are Carlon or approved equal.

L. Install conduit in accordance with NECA "Standard of Installation." Install nonmetallic conduit in accordance with manufacturer's instructions.

M. Arrange supports to prevent misalignment during wiring installation. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits. Fasten conduit supports to building structure and surfaces under provisions of Division 1. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports. Do not attach conduit to ceiling support wires.

N. Arrange conduit to maintain headroom and present neat appearance. Route exposed conduit parallel and perpendicular to walls. Route conduit installed above accessible ceilings parallel and perpendicular to walls. Route conduit in and under slab from point-to-point. Do not cross conduits in slab.
O. Maintain adequate clearance between conduit and piping. Maintain 12-inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
P. Cut conduit square using saw or pipe cutter; de-burr cut ends. Bring conduit to shoulder of fittings; fasten securely. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
Q. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2 inch (50 mm) size.
R. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints. All expansion and deflection fittings shall have a ground strap. Provide suitable pull string in each empty conduit except sleeves and nipples. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
S. Ground and bond conduit under provisions of NEC 250.

2.2 BUILDING WIRE & CABLE

A. Building Wire and Cable shall be copper with 600V insulation rated at 75°C minimum, Type XHHW insulation for feeders and branch circuits larger than #3 AWG; Type THHN/THWN insulation for feeders and branch circuits #4 AWG and smaller.
B. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.
C. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.
D. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors “white” or “gray”. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or along their entire extensions beyond raceway ends, whichever is less.
E. Final connections to motors shall be made with 18” of neoprene sheathed flexible conduit.
F. Minimum branch circuit conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.
G. Fire alarm and security system wiring shall be No. 16 twisted non-shielded pairs for alarm and trouble circuits and a minimum of #14 AWG for device power, control and alarm annunciation circuits. Fire alarm system riser circuits shall be 2-hour rated, CI type (circuit integrity) cable per NFPA 72 and NEC 760.
H. Other wires and cables required for the various systems described elsewhere in this section of the Specifications shall be as specified herein, as shown on the Contract Drawings, or as recommended by the manufacturer of the specific equipment for which they are used, all installed in conduit.
I. Metal clad sheathed cable NFPA 70, type MC may be used for branch circuitry where shown and where run concealed and not subject to physical damage. All branch circuits shall be run in conduit from the panelboard to the first outlet. All type MC cable used shall contain a full size insulated ground conductor. All conductors shall be copper. All type MC cable insulation used shall have voltage rating of 600 volts, shall have a temperature rating of 75° C, and shall be thermoplastic material. Armor material shall be steel and armor design shall be interlocked metal tape. Fire alarm rated MC cable may be used for fire alarm work where concealed and approved by the Authority Having Jurisdiction.

J. Wiring materials except MI cable shall be manufactured by Triangle, Essex, General Cable, AFC, Southwire or equal.
K. Concealed Dry Interior Locations: Use only building wire Type THHN/THWN or XHHW insulation in raceway, or metal clad cable where concealed and code acceptable.
L. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway.
M. Above Accessible Ceilings: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway or metal clad cable where code acceptable.
N. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway.
O. Exterior Locations: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway.
P. Underground Installations: Use only building wire, Type THHN/THWN or XHHW insulation, in raceway.
Q. Wiring methods, in general, are as follows:
    1. Galvanized rigid steel conduit shall be used for telephone system sleeves for main cable runs between floors, closets, etc. and for sweeps, bends, etc. in ductbanks and as specifically noted on the plans. EMT shall be used generally for exposed circuiting in unfinished spaces. Metal clad cable (type MC) may be used for branch circuiting and fire alarm rated MC cable for fire alarm circuiting where run concealed and where code acceptable.
    2. To prevent transmittal of vibration to conduit, connections to any vibration producing equipment (i.e. transformers, motors, etc.) shall be terminated by 18 inches of flexible metal conduit. Where flexible connections are exposed to grease and oil, liquid-tight flexible metal conduit shall be used.
    3. In general, no splices or joints shall be permitted in either feeders or branches except at outlets or accessible junction boxes. Splices in wire #8 AWG and smaller shall be pigtail type, made mechanically tight. All conduit systems shall be complete.
    4. Raceway, boxes, etc., run on walls in wet areas which are subject to being washed down, shall be mounted on the walls with 1/4" stand-offs. All boxes shall be cast type.
R. Route wire and cable as required to meet the Project Conditions. Install cable in accordance with the NECA "Standard of Installation." Use solid conductor for feeders and branch circuits 10 AWG and smaller. Use stranded conductors for control circuits. Use conductor not smaller than 12 AWG for power and lighting circuits. Use conductor not smaller than 16 AWG for control circuits. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet (25 m). Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet (160 m). Pull all conductors into raceway at same time. Use suitable wire pulling lubricant for building wire 4 AWG and larger. Protect exposed cable from damage.
S. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system, cables that are not part of the ceiling system cannot be supported from ceiling supports. Do not rest cable on ceiling panels. Use suitable cable fittings and connectors. Neatly train and lace wiring inside boxes, equipment, and panelboards.
T. Clean conductor surfaces before installing lugs and connectors. Make splices, taps, and terminations to carry full ampacities of conductors with no perceptible temperature rise. Use suitable reducing connectors or mechanical connector adapters for connecting aluminum conductors to copper conductors. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape un-insulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller. Identify and color code wire and cable. Identify each conductor with its circuit number or other designation indicated.

2.3 BOXES

A. Outlet Boxes:
    1. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations shall be of cast-metal type having

hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps are not allowed in new construction.

2. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of NFPA 70. Boxes shall not be less than 1-1/2" deep unless shallower boxes are required by structural conditions and are specifically approved by Architect. Ceiling and bracket outlet boxes shall not be less than 4" octagonal except that smaller boxes may be used where required by particular fixture to be installed. Flush or recessed fixtures shall be provided with separate junction boxes when required by fixture terminal temperature requirements. Switch and receptacle boxes shall be 4" square or of comparable volume. Luminaire and equipment supporting boxes shall be rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.
3. Provide metallic boxes rated for 2-hour, fire-rated walls with gasket to reduce noise-transmission in all fire-rated walls. A minimum horizontal distance of 24-inches shall separate metallic boxes located on opposite sides of fire walls. This minimum horizontal spacing may be reduced using UL classified wall opening protective materials, commonly known as "putty pads" or "insert pads" pending written approval from the local authority having jurisdiction (AHJ). Refer to Architect's plans for all wall types prior to bid and any related work that will require 2-hour fire ratings.
4. All boxes installed in demising walls separating tenants, electrical room walls, mechanical room walls, conference room walls, nurse's office walls, and other room walls deemed private by the Owner shall be provided with gasket to reduce noise-transmission.
5. All boxes installed in exterior walls shall be provided with appropriate caulking and gaskets to seal off and prevent air leakage. Follow caulking and gasket manufacturer's installation guidelines to ensure correct and effective installation.
6. Acceptable Manufacturers:
    a. Appleton
    b. Crouse Hinds
    c. Steel City
    d. RACO

B. Pull and Junction Boxes: Where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish and install appropriately designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code. Where intermediate cable supports are necessary because of box dimensions, provide insulated removable core brackets to support conductors. Junction boxes are to be equipped with barriers to separate circuits. Where splices are to be made, boxes shall be large enough to provide ample work space. All conductors in boxes are to be clearly tagged to indicate characteristics. Boxes shall be supported independently of raceways. Junction boxes in moist or wet areas shall be galvanized type. Boxes larger than 4-inches square shall have hinged covers. Boxes larger than 12-inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.

C. Fiberglass Handholes shall be die molded glass fiber. Cable Entrance shall be pre-cut 6-inch x 6-inch (150 mm x 150 mm) cable entrance at center bottom of each side. Cover shall be glass fiber weatherproof cover with nonskid finish.

D. Install boxes in accordance with NECA "Standard of Installation." Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

E. Set wall mounted boxes at elevations to accommodate mounting heights indicated or specified in section for outlet device. Electrical boxes are shown on drawings in approximate locations unless dimensioned. Adjust box location up to 10-feet (3m) if required to accommodate intended purpose. Orient boxes to accommodate wiring devices. Maintain headroom and present neat mechanical appearance.

F. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 7.

G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
H. Use flush mounting outlet box in finished areas. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening. Do not install flush mounting box back-to-back in walls; provide minimum 6-inches (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic rated walls. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness. Use stamped steel bridges to fasten flush mounting outlet box between studs. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
I. Use adjustable steel channel fasteners for hung ceiling outlet box. Do not fasten boxes to ceiling support wires. Support boxes independently of conduit. Use gang box where more than one device is mounted together. Do not use sectional box. Use gang box with plaster ring for single device outlets. Use cast outlet box in exterior locations exposed to the weather and wet locations. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations. Set floor boxes level.
J. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.
K. Adjust floor box flush with finish flooring material. Adjust flush-mounting outlets to make front flush with finished wall material. Install knockout closures in unused box openings.

2.4 WIRING DEVICES

A. Provide wiring device type plates for all wall-mounted devices. All wall plates shall be either brushed aluminum or smooth high impact nylon for all public areas as directed by the Architect. Provide galvanized steel for all Utility, Electric and Mechanical Rooms. Colors of wall plates as directed by the Architect.
B. Wiring devices standard for the project (i.e., with no specific type indicated) shall conform to the following:
    1. Visible part colors of wiring devices shall be as directed by the Architect for all public areas. Provide Ivory colored devices for all Utility, Electrical and Mechanical rooms.
    2. Exclude compact type devices.
C. Wiring device switches shall be toggle type, A.C. quiet design, specification grade, 20 amps on 120 volt circuits. Switches shall be mounted 48-inches to center line above finished floor unless noted otherwise. Equivalent 277volt, 20 amp switches shall be used where required.
D. Standard duplex convenience receptacles shall be 125volt, 20 amps, three wire (two circuit wires plus ground), “U-slot” ground NEMA configuration 5-20R, specification grade. Receptacles shall be mounted 18” to center line above finished floor unless noted otherwise. Where indicated on plans provide receptacles with ground fault current interrupters, UL Class A; 20A, 125V.
E. Non-standard convenience receptacles and special purpose power supply receptacles shall be as listed on plans.
F. Use “Hospital-Grade” receptacles in areas of patient care for all healthcare facilities as defined in the National Electrical Code and in nurses’ office areas of schools. Day-care facilities, Preschool and Kindergarten rooms & other areas indicated on the plans shall be tamper resistant type receptacles. When connected to an Essential Electrical System, all “Hospital Grade” receptacles shall be illuminated.
G. Provide ground fault circuit interrupter (GFCI), weather-resistant type receptacles in all wet and damp locations as defined by the National Electrical Code. All outdoor receptacles and where indicated on the plans shall be installed in a weatherproof while-in-use enclosures.
H. Weatherproof Receptacle Enclosures shall be NEMA 3R rated for rain-tight while-in-use, gasketed, impact resistant thermoplastic with hinged gasketed device cover.
I. Provide extension rings to bring outlet boxes flush with finished surface. Clean debris from outlet boxes. Install devices plumb and level. Install receptacles with grounding pole on top. Connect wiring device grounding terminal to branch circuit equipment grounding conductor. Use jumbo size plates for outlets

installed in masonry walls. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

J. Install wall switch 48 inches above finished floor to top of handle. On position, shall be up. Install convenience receptacles 18-inches above finished floor. Install convenience receptacle 6-inches above backsplash of counter. Install dimmer switches 48 inches above finished floor to top.

K. Verify that each receptacle device is energized. Test each receptacle device for proper polarity. Test each GFCI receptacle device for proper operation.

2.5 CABINETS & ENCLOSURES

A. Cabinets shall be as follows: Boxes: Galvanized steel. Box Size: As required and/or indicated on plans. Backboard: Provide 3/4-inch thick plywood backboard for mounting terminal blocks. Paint matte white. Fronts: Steel, flush type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel. Knockouts: As required and/or indicated on plans. Provide metal barriers to form separate compartments wiring of different systems and voltages. Provide accessory feet for free-standing equipment.

B. Hinged Cover Enclosures shall be as follows: Construction: NEMA 250, Type 1, 3R, or 4 steel enclosure, as required and/or indicated on plans. Covers: Continuous hinge, held closed by flush latch operable by key or hasp and staple for padlock. Provide interior plywood panel for mounting terminal blocks and electrical components; finish with white enamel. Enclosure Finish: Manufacturer's standard enamel.

C. Install in accordance with NECA "Standard of Installation." Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner under the provisions of Section 16190. Install cabinet fronts plumb.

D. Clean electrical parts to remove conductive and harmful materials. Remove dirt and debris from enclosure. Clean finishes and touch up damage.

E. ICS 4 - Terminal blocks for industrial control equipment and systems. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts. Provide ground bus terminal block, with each connector bonded to enclosure.

F. Provide grounding provisions for all cabinets/enclosures and bond to grounding system as required per Code.

2.6 GROUNDING & BONDING

A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70 and the following:
   1. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non-metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.
   2. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of each run utilizing grounding bushings and jumpers.
   3. Provide grounding bonds for all metallic conduits of the light and power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.
   4. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this be equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus. Exclude the jumpers where directed. This exclusion will be required where an isolated ground for electronic equipment is to be maintained.

5. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.
6. Bonding conductors on the load size of the service device and equipment grounding conductors shall be sized in relation to the fuses or trip size of the overcurrent device supplying the circuit.
7. The central equipment for the fire protective alarm system and telephone system shall have its grounding terminal connected to the grounding electrode by means of a No. 6 green coded insulated conductor, run in 3/4" conduit. Utilize a ground clamp of a type specifically manufactured for the purpose.
8. Perform inspections and tests listed in NETA ATS, Section 7.13. Document test results in Record Documents.
9. Grounding means shall never exceed 10 ohms when located outdoors, or 5 ohms when located indoors.
10. An acceptable means of grounding is to provide an underground 2” thick, concrete-encased electrode of either ½” diameter, electrically conductive reinforcing bar of #4/0 bare copper conductor (minimum of 20-feet in length) per NEC 250.52(A)(3).

2.7 EQUIPMENT WIRING SYSTEMS

A. Cords & Caps: Manufacturers: Hubbel, Pass & Seymour or Arrow Hart. Attachment Plug Construction: Conform to NEMA WD 1. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment. Cord Construction: ANSI/NFPA 70, Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Motor Control Equipment: Each motor shall have a starter furnished under this Section where it is not being supplied by other sections. Wire and installed under this Section, unless otherwise noted herein or on the drawings.
   1. Connect the motor starting devices for all motors, except where otherwise specifically provided for under other sections, furnish all necessary connections between controllers and motors, in conduit and leave motors ready to start. Change connections, if necessary, to secure proper rotation of motors.
   2. Perform all the necessary wiring in connection with the motor starting and remote control equipment, where so designated, furnished under other sections. Where control or starting equipment is sent to the job as individual units, they shall be installed, wired up complete and left ready for operation under work of this section.
   3. Wiring to motor shall be in rigid conduit with watertight flexible conduit from wall to motor only.

C. Included in the general requirements for motor control equipment wiring and connections, the following specified items shall be performed:
   1. Installation and connection of motor controls which will be furnished under the heating, ventilating and air conditioning section and the plumbing section.

D. Starters by This Contractor: Where starters are not provided under other sections, this Contractor shall furnish starters for motors 1/2 HP and larger and where required by the control sequence for smaller motors and shall be magnetic across the line starters with adjustable overload protection in each phase line, all in NEMA 1 enclosures. Starters shall be solid state or acceptable substitute. Combination starters shall be with fused or non-fusible disconnect as required.
   1. Magnetic starters shall have 120 volt holding circuits, integral transformers, auxiliary contacts as required by the control sequence and integral selector switches with push-to-test pilot lights. One side of each pilot light shall be connected on the load side of the motor starter.
   2. Integral transformers shall have overload protection on the secondary section and, also, the secondary neutral shall be grounded.
   3. Starters shall be as manufactured by Square D Company or General Electric.

E. Temperature control wiring shall be by others as indicated under the heating, ventilating and air conditioning section.

F. Provide a suitable plywood backboard on a wall and/or angle iron or unistrut framework with plywood for all starters. Starters will be installed and wired under this section.
G. All starters shall be located next to the panel feeding same, if panel is in a closet or utility space, unless noted otherwise on the drawings. If panel is located in a finished space (i.e. corridor, gymnasium, etc.) starters shall be located in nearby utility closet or space acceptable to the Engineer.
H. Nameplates: Each starter shall have a 1.0" x 2.5" hot stamped nameplate identifying the unit and panel it is fed from. The lettering shall be white 1/2" high in a black background.
I. Building and Energy Management Systems (BMS/EMS): This contractor shall provide a price to the Mechanical Contractor to provide power and data wiring to all BMS/EMS components requiring same. Coordinate with Mechanical Contractor prior to bid and prior to any work the exact wiring requirements, connections requirements and exact locations for all BMS/EMS components. Such components shall include, but may not be limited to:
    1. Control transformers
    2. Central equipment controllers
    3. BMS controllers
    4. BMS Head-end equipment
    5. Line-voltage thermostats

2.8 SUPPORTING DEVICES

A. Materials and Finishes: Provide adequate corrosion resistance. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products. Steel channel shall be galvanized.
B. Anchors and Fasteners:
    1. Concrete Structural Elements: Use precast insert system, expansion anchors.
    2. Steel Structural Elements: Use beam clamps, or welded fasteners.
    3. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
    4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
    5. Solid Masonry Walls: Use expansion anchors or preset inserts.
    6. Sheet Metal: Use sheet metal screws.
    7. Wood Elements: Use wood screws.
C. Installation: Install products in accordance with manufacturer's instructions. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation". Do not fasten supports to pipes, ducts, mechanical equipment, and conduit. Do not use spring steel clips and clamps. Do not use powder-actuated anchors. Do no drill or cut structural members. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts. Install surface-mounted cabinets and panelboards with minimum of four anchors. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

2.9 ELECTRICAL IDENTIFICATION

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background. Locations: Each electrical distribution and control equipment enclosure, communication cabinets. Letter Size: Use 1/8 inch letters for identifying individual equipment and loads. Use 1/4 inch letters for identifying grouped equipment and loads.
B. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use for identification of individual power receptacle faceplates indicating panel & circuit number the outlet is fed from and control device stations. In addition to nameplates as described above, use labels on all panelboards, disconnect switches and enclosed circuit breakers to identify where the equipment is fed from, voltage & phase.
C. Wire markers: Tape, or tubing type wire markers. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection. Power and Lighting Circuits shall be

marked with panel and branch circuit or feeder number as indicated on drawings. Control Circuits shall be marked with control wire number indicated on schematic and interconnection diagrams on drawings

D. Conduit markers: Corrosion and abrasion resistant. Location: Furnish markers for each conduit longer than 6 feet (2 m). Spacing: 20 foot on center. Indicate voltage and phase.
E. All panelboards shall be provided with a typed (hand written is not allowed) circuit directory indicating the load fed by each circuit breaker and it's location in the building.

2.10 TWO-WINDING TRANSFORMERS

A. Division 1 - Material and Equipment: Product Options and Substitutions.
B. Manufacturers:
   1. Square D Company.
   2. Cutler Hammer
   3. Siemens
   4. Substitutions: Under the provisions of Division 1.
C. Description: NEMA ST 20, factory-assembled, air cooled dry type transformers, ratings as indicated in schedule on plans. Transformers shall comply with NEMA TP-1, Energy Star Requirements and Department of Energy Efficiency Standards.
D. Primary Voltage: 480 volts, 3 phase unless otherwise noted on plans.
E. Secondary Voltage: 208Y/120 volts, 3 phase unless otherwise noted on plans.
F. Insulation system and average winding temperature rise for rated kVA as follows:
   1. 1-15 kVA: Class 185 with 115 degrees C rise.
   2. 16-500 kVA: Class 220 with 115 degrees C rise.
G. Case temperature: Do not exceed 35 degrees C rise above ambient at warmest point at full load.
H. Winding Taps:
   1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
   2. Transformers 15 kVA and Larger: NEMA ST 20.
I. Sound Levels: NEMA ST 20.
J. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger.
K. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
L. Mounting:
   1. 1-15 kVA: Suitable for wall mounting.
   2. 16-75 kVA: Suitable for wall, floor, or trapeze mounting.
   3. Larger than 75 kVA: Suitable for floor or trapeze mounting.
M. Coil Conductors: Continuous windings with terminations brazed or welded.
N. Enclosure: NEMA ST 20, Type 1. Provide lifting eyes or brackets.
O. Isolate core and coil from enclosure using vibration-absorbing mounts.
P. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.
Q. Set transformer plumb and level.
R. Use flexible metal conduit, 2-feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
S. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.
T. Mount floor-mounted transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure. Provide 4" high concrete housekeeping pad for transformers.
U. Mount trapeze-mounted transformers as indicated.
V. Provide seismic restraints.
W. Provide grounding and bonding per Code.

2.11 ENCLOSED SWITCHES

A. Fusible Switch Assemblies shall be provided in accordance with the following. Description: NEMA KS 1, Type GD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses. Provide NEMA 3R where located outdoors, kitchens or other interior wet areas.
B. Non-fusible switch assemblies shall be provided in accordance with following. Description: NEMA KS 1, Type GD with externally operable handle interlocked to prevent opening front cover with switch in ON position enclosed load interrupter knife switch. Handle lockable in OFF position. Provide NEMA 3R where located outdoors, kitchens or other interior wet areas.
C. Install in accordance with NECA "Standard of Installation". Install fuses in fusible disconnect switches. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

2.12 PANELBOARDS

A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
B. Panelboard Bussing: Bus bars shall be copper. Provide copper ground bus bar in all panelboards.
C. Minimum Integrated Short Circuit Rating: 10,000 amperes RMS symmetrical for 240 volt panelboards; 65,000 amperes RMS symmetrical for 480 volt panelboards, or as indicated.
D. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.
E. Enclosure: NEMA PB 1, Type 1.
F. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 20 inches wide for 480 volt panelboards.
G. Cabinet Front: Flush or Surface cabinet front as scheduled with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard ANSI 49 enamel.

2.13 ENCLOSED CIRCUIT BREAKERS

A. Enclosed Molded Case Circuit Breaker: Comply with NEMA AB 1. Include provisions for padlocking. Provide insulated grounding lug in each enclosure. Provide Products suitable for use as service entrance equipment where so applied. Fabricate enclosure from steel.
B. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions. Install enclosed circuit breakers plumb. Provide supports in accordance with these specifications. Height: 5 ft (1.6 M) to operating handle. Provide engraved plastic nameplates.
C. Inspect each circuit breaker visually. Perform several mechanical ON-OFF operations on each circuit breaker. Verify circuit continuity on each pole in closed position. Determine that circuit breaker will trip on overcurrent condition, with tripping time to NEMA AB 1 requirements. Include description of testing and results in test report.

2.14 FUSES

A. All fuses shall be rated for proper voltage in which they are applied. Interrupting ratings shall be greater than the short circuit current available at the terminals of the switch.
B. Fuse types:
   1. Fuses for branch circuits shall be time delay class J.
   2. Fuses for equipment other than motor loads shall be general fast acting RK-5 or Class J.
   3. Control power transformers for motor controller circuits shall be as recommended by motor starter and motor control center manufacturer.
   4. Fuses for motors shall be sized at 250% of the motor FLA.
   5. Fuses for non-motor loads shall be sized at 125% of the rated FLA of equipment served.

6. Fuses for elevator lifts shall be dual element type and sized in accordance with the elevator manufacturer's recommendations.

C. Spare Fuses
1. Provide spare fuses in the amount of 20% (not less than three (3) nor more than nine (9) of all sizes and types).
2. Spare fuses shall include general purpose fuses, motor fuses, and control fuses used in motor control centers, starters etc.
3. A complete list and quantity of spare fuses shall be submitted with record drawings for review.

2.15 ENCLOSED MOTOR CONTROLLERS

A. The Electrical Contractor shall review the mechanical drawings and coordinate with the Mechanical Contractor for electrical components of the mechanical equipment and systems such as motors, factory mounted motor starters, factory mounted disconnect switches, variable frequency drives and controls to be provided under Division 15 (by the Mechanical Contractor).
B. The Electrical Contractor shall provide motor starters, variable frequency drives and disconnect switches for equipment shown on the drawings where the Mechanical Contractor is not providing such equipment.
C. The electrical contractor shall provide all power wiring for all HVAC equipment.

2.16 ENCLOSED CONTACTORS

A. General purpose contactors: NEMA ICS 2, AC general purpose magnetic contactor. Coil Voltage as indicated. Poles as indicated. Size as indicated. Enclosure per ANSI/NEMA ICS 6, Type as scheduled.
B. Lighting contactors: NEMA ICS 2, magnetic lighting contactor. Coil Voltage as indicated. Poles as indicated. Size as indicated. Contact Rating shall match branch circuit overcurrent protection, considering de-rating for continuous loads.
C. Accessories: Provide Pushbuttons and Selector Switches per NEMA ICS 2, heavy duty type. Provide indicating lights per NEMA ICS 2, push-to-test type. Provide auxiliary contacts per NEMA ICS 2, Class A300 or A600 as required per equipment served.

2.17 INTERIOR LUMINAIRES

A. Lighting fixtures shall be in accordance with identifications as follows:
B. All lamping shall be of the highest quality available.
C. Finishes shall be as selected by the Architect or as indicated on the plans.
D. Any additional appurtenances required for installation and operation, where same are not covered by the identification used on the drawings, shall be included. Lighting fixtures and equipment shall be furnished complete, wired and assembled, including canopies, lamps and other incidental items. Install specified lamps in each luminaire.
E. Recessed fixtures shall be coordinated with ceiling construction by the Electrical Contractor prior to Bid. Refer to the Architect's plans, details and elevations for ceiling types by area. Provide plaster trim kits as required by ceiling construction.
F. Exact location of all fixtures shall be confirmed with Architect prior to rough-in. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
G. Recessed fixtures throughout shall have their components, wiring and external connections coordinated for use in ceilings utilized as air handling plenums. Install recessed luminaires to permit removal from below. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating. Install clips to secure recessed grid-supported luminaires in place
H. Fixtures for use outdoors or in areas designated as damp locations, shall be suitably gasketed and UL listed for such applications.

I. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire
J. Emergency batteries for exterior fixtures shall be remote mounted within the building. Verify maximum distances for remote mounting the emergency batteries with the manufacturer prior to installation. Locate remote emergency batteries above accessible ceilings or utility rooms as required. Provide test switches for all emergency batteries as required.
K. Unless noted otherwise, all fixtures shall be 3500K and have a minimum CRI of 85.
L. The Contractor shall obtain all information relative to the exact type of hung ceilings and suspension systems to be installed before ordering any recessed fixtures. This Contractor shall furnish the proper type fixtures applicable to the ceiling framing system. If, other than the type of fixtures specified are required for installation due to the type of ceiling construction, this Contractor shall furnish and install the proper type fixtures and mounting appurtenances required at no extra charge.
M. The Contractor shall coordinate the exact locations of all lighting fixtures with the ceiling pattern during the construction period and before installation of the fixtures. Interferences between lighting fixtures, and other equipment, shall be brought to the attention of the General Contractor.
N. Include the aiming and/or adjustments of all lighting fixtures requiring same in accordance with instructions issued by the Architect in the field. Aim and adjust luminaries as indicated or as directed by the Owner, Architect or Engineer. Position exit sign directional arrows as indicated. Operate each luminaire after installation and connection. Ensure proper connection and operation.
O. Lighting fixtures shall be supported from building structure only, not from hung or suspended ceiling, by means of chains or threaded rods. The use of tie wire will not be allowed. All fixtures shall include seismic clips and shall be supported to comply with seismic regulations. Install suspended luminaires using pendants supported from swivel hangers or other suitable leveling means. All rows of fixtures shall be level, aligned with building lines and run parallel to each other. Provide pendant length required to suspend luminaires at indicated height. Support luminaires to building structure, independent of ceiling framing.

2.18 FIRE ALARM SYSTEM

A. GENERAL
   1. The contractor shall submit complete documentation for the Fire Alarm/Life Safety System Data Sheets for all items to ensure compliance with these specifications. Copies of this information shall be submitted as required to the Architect award of this work and shall be subject to the approval of the architect.
   2. The contractor shall submit, as part of the complete bid documentation package, certification that the engineered system distributor is a fully authorized factory trained and certified distributor of the system detailed within this specification.
   3. All equipment and material shall be new and unused, and listed by Underwriter's Laboratories for the specific intended purpose. All control panel components, field peripherals and interactive computer peripherals shall be designed for continuous duty operation without degradation of function or performance.
   4. All equipment covered by this specification or noted on installation drawings shall be the best equipment suited for the application and shall be provided by a single manufacturer.
   5. Provide all equipment and accessories and compatible devices for a complete and fully functioning addressable fire alarm system. The fire alarm system shall be coordinated with and inspected by the local fire department, and any inconsistency mentioned during any inspection shall be corrected by contractor at no additional cost to owner.
   6. The control panel shall contain a microprocessor with 10/100 ethernet media access controller (MAC). The system shall be designed specifically for fire detection, and notification applications.
   7. The installing contractor shall coordinate master-box, radio-box, and/or dialer requirements with local fire department.
B. FIRE ALARM LIFE SAFETY SYSTEM SEQUENCE OF OPERATION
   1. Public Mode: The operation of a manual station or activation of any automatic alarm initiating device (system smoke, heat, waterflow) in the common areas of the building, shall automatically:

a. Initiate the transmission of the alarm to the Municipal Fire Station or approved Central Station via the Local Energy or Radio Master-box where required by Code.
b. Sound a code 3 temporal evacuation signal over all audible circuits.
c. Flash all visual signals throughout the building in a synchronized manner.
d. Flash an alarm LED and sound an audible signal at the FACP. Upon acknowledgement, the alarm LED shall light steadily and the audible shall silence. Subsequent alarms shall re-initiate this sequence.
e. Upon alarm initiation by an elevator lobby smoke detector or other designated recall device, recall all elevators that serve the floor of initialization to the main egress level. If the alarm initiates on the main egress level, return the elevator to the alternate floor as directed by the local authority having jurisdiction.
f. Visually indicate the alarm initiating device type and location via the LCD display located at the FACP (and at any remote annunciators) and (illuminate the appropriate alarm zone LED at the remote annunciator).
g. Automatically shut down or control HVAC equipment to initiate smoke control functions as required. Manual override controls and programmable relay interface shall serve as an interface to the Building Automation System.
h. Operate prioritized outputs to release all magnetically held smoke doors and magnetically locked doors throughout the building.
i. Activate the exterior weatherproof beacon.

2. Private mode: The activation of any automatic local alarm initiating device (sounder-base with smoke, or combination smoke/carbon monoxide device) within an apartment shall automatically:
   a. Sound a code 3 temporal evacuation signal for smoke to all alarm devices within the apartment and a code 4 temporal evacuation signal for carbon monoxide to all alarm devices within the apartment.
   b. Visually indicate a supervisory trouble condition of the type and location of the initiating device via the LCD display located at the FACP (and at any remote annunciators) and (illuminate the appropriate zone LED at the remote annunciator).

C. WIRING
1. Provide in accordance with manufacturer's instructions all wiring, conduit and outlet boxes required for the installation of complete system as described herein and as shown on the drawings. Wiring shall be Class A.
2. Installation and fire alarm system wiring shall be installed in metal raceway. An equipment bonding conductor shall be provided in all flexible metallic raceways.
3. Color code for fire alarm systems shall be per the State Fire Alarm code.
4. DC supply to the main fire alarm panel shall be white and black. Fire alarm primary power source shall be on dedicated branch circuit. Circuit breaker locks shall be used. If a separate feed is required for the battery charger it shall be black and white unless the main fire alarm panel required only AC feed. In this case the conductors to the battery charger shall be red and white and shall be on a circuit breaker of fits own.
5. Conductors shall be minimum #14-gauge solid copper type THHN/THWN. Conductor's size shall be increased as required to maintain voltage drop to a maximum of 3%. All AC and DC portions of the system shall be installed in separate raceway. Addressable loop wiring may be #16 providing manufacturer's recommended distance is observed. Systems requiring shielded wiring for addressable loops shall not be acceptable.
6. Red painted terminal cabinets with hinged local covers shall be provided at all junction points. All conductor splices shall be made on screw type terminal blocks, wire nuts shall not be used. All terminals within terminal cabinet shall be properly labeled. Provide terminal cabinet at each building cable entrance and at other locations as required.
7. All fire alarm initiating zone and signal wiring shall be wired Class A.
8. Final connections between the equipment and the wiring system shall be made under the direct supervision of a representative of the manufacturer.
9. Upon completion of the installation of fire alarm equipment, the electrical contractor shall provide to the engineer a signed statement substantially in the form as follows:

a. The undersigned having been engaged as the electrical contractor on this project confirms the fire alarm equipment was installed in accordance with the specifications and in accordance with wiring diagrams, instructions, and directions provided to us by the manufacturer.

D. GUARANTEE AND FINAL TEST
1. All testing (pre-testing, final testing, quarterly testing and program change testing) to be coordinated with the owner and scheduled in advance so that owners and personnel can be present during testing. Contractor to certify that all tests comply with the “State Fire Code”, latest edition.
2. Before this installation shall be considered complete and acceptable to the awarding authorities, a complete test on the system shall be performed as follows:
   a. A pre-test will be held by the electrical contractor with the manufacturer’s authorized representative present. After certification of a complete pre-test, the installing contractor shall inform the authority having jurisdiction of the outcome of the test and will re-inspect in the presence of the authority having jurisdiction and the manufacturer’s authorized representative.
   b. Final test: The electrical contractor in the presence of authorized representative of the manufacturer and the fire department shall operate every manual station, smoke detector, and thermodetector. Each station/detector circuit and horn circuit shall be opened in at least two locations to check for the presence of correct supervisory circuitry. When this testing ahs been completed to the satisfaction of both the electrical contractor’s job foreman and the representative of the manufacturer, a letter from the contractor cosigned by the manufacturer attesting t the satisfactory completion of said testing, shall be forwarded to the owner.
3. The electrical contractor shall guarantee all equipment and wiring to be free from inherent mechanical and electrical defects for a period of one year from the date of final acceptance.
4. The contractor shall provide the Owner with a formal written equipment guarantee upon completion of the installation and testing of the system. The guarantee period shall begin on the day of acceptance of the system by the Owner and shall provide for a period of one year. This guarantee shall be indicated in the manufacturer’s submission prior to approval. This guarantee shall be as normal policy by the equipment manufacturer.
5. The manufacturer shall maintain a full-time service and parts facility, with seven days per week, 24 hour per day service available.
6. All service technicians shall be licensed by the State Fire Code covering service and maintenance of systems.
7. Include as part of the contract, the four quarterly tests following the final acceptance test. Provide quarterly testing in conformance with the State Fire Code latest addition.

2.19 DATA

A. The Electrical Contractor shall provide and install the data outlets and wiring per the Owner’s specifications and direction per data outlet and wiring as shown on the plans. Each data connection shall include the following:
1. Data outlet installed flush in the wall unless otherwise required by the site conditions and approved by the Owner. The outlet shall include faceplate, ID label, inserts, jacks and all other required accessories for a complete installation.
2. Wiring consisting of Category 6, 24AWG, copper cabling installed from outlet to patch panel. All wiring shall be installed concealed in finished & public spaces unless otherwise required by the site conditions and approved by the Owner. shall be used from the outlet to an accessible ceiling. In unfinished or utility spaces, the data cabling shall be installed in EMT conduit where not concealed. Accessible above ceiling installations shall use J-hooks unless cable tray is used. Use plenum rated cable where installed in plenum return spaces per the Mechanical Contractors direction prior to bid.
3. Patch panel and outlet terminations. Provide identification labels at each end of the cable per the Owners requirements. Coordinate with Owner for nomenclature.
4. Test each cable for signal strength per EIA/TIA standards and record all results to be submitted to the Owner. All defective cable and/or termination shall be replaced at no cost to the Owner.

B. Provide patch panel(s) to accommodate each outlet plus 10% spare. Provide rack(s) to accommodate each patch panel.
C. Servers, switches, routers and active electronic equipment by Owner.

2.20 TELEPHONE

A. The Electrical Contractor shall provide and install the telephone outlets and wiring per the Owner's specifications and directions as shown on the plans. Each telephone connection shall include the following:
   1. Telephone outlet installed flush in the wall unless otherwise required by the site conditions and approved by the Owner. The outlet shall include faceplate, ID label, inserts, jacks and all other required accessories for a complete installation.
   2. Wiring consisting of Category 6, 24AWG, copper cabling installed from outlet to patch panel. All wiring shall be installed concealed in finished & public spaces unless otherwise required by the site conditions and approved by the Owner. shall be used from the outlet to an accessible ceiling. In unfinished or utility spaces, the data cabling shall be installed in EMT conduit where not concealed. Accessible above ceiling installations shall use J-hooks unless cable tray is used. Use plenum rated cable where installed in plenum return spaces per the Mechanical Contractors direction prior to bid.
   3. Telephone terminal board or PBX (private branch exchange) equipment and outlet terminations. Provide identification labels at each end of the cable per the Owners requirements. Coordinate with Owner for nomenclature.
   4. Test each cable for signal strength per EIA/TIA standards and record all results to be submitted to the Owner. All defective cable and/or termination shall be replaced at no cost to the Owner.
B. PBX (private branch exchange) equipment by Owner.

PART 3 – EXECUTION

3.1 BASIC REQUIREMENTS

A. Adhere to best industry practice and the following:
   1. All work shall be concealed.
   2. Route circuitry runs embedded in concrete to coordinate with structural requirements.
   3. Equip each raceway intended for the future installation of wire or cable with a nylon pulling cord 3/16" in diameter and clearly identify both ends of the raceway.
   4. Provide all outlet boxes, junction boxes, and pull boxes for proper wire pulling and device installation. Include those omitted from the drawings due to symbolic methods of notation.
   5. Utilize lugs of the limited type to make connections at both ends of cables installed on the line side of main service overcurrent and switching devices. Provide cable limiters for each end of each service entrance cable.
   6. Beyond the termination of raceways, fireproof the following:
      a. All wires and cables within pad-mounted transformer enclosure.
      b. All service feeder cables ahead of main service overcurrent protection devices, and elsewhere where not in raceways.
   7. Fireproofing of wires and cables shall be by means of a half-lapped layer of arcproof or by means of sleeving of a type specifically manufactured for the purpose. Ends of tape or sleeving shall be severed with twine. Fireproofing shall be extended up into raceways. After conductors have been finally shaped into their permanent configuration, fireproofing tape or sleeving shall be coated with silicate of soda (water glass). Fireproofing shall be applied in an overall manner to raceway groupings of conductors.
   8. Provide all sleeves through fireproof and waterproof slabs, walls, etc., required for electric work.
   9. Provide waterproof sealing for the sleeves through waterproof slabs, walls, etc.
   10. Provide fireproof sealing for the sleeves through fireproof walls, slabs, etc.

11. Provide fireproof sealing for the openings in fireproof walls, slabs, etc., resulting from removal of existing electrical sleeves, conduits, poke-thru's etc.
12. No splicing of wires will be permitted in the Fire Alarm System.
13. Bundle wiring passing through pull boxes and panelboards in a neat and orderly manner with plastic cable ties. Cable ties shall be by Ty-Raps as manufactured by Thomas & Betts, Holub Industries Inc., Quick Wrap, Bundy Unirap, or equal.
14. Turn branch circuits and auxiliary system wiring out of wiring gutters at 90 degrees to circuit breakers and terminal lugs.

3.2 TESTING REQUIREMENTS & INSTRUCTIONS

A. Where any repairs, modifications, adjustments, tests or checks are to be made, the Contractor shall contact the Engineer to determine if the work should be performed by or with the Manufacturer's Representative.
B. Tests are to:
   1. Provide initial equipment/system acceptance.
   2. Provide recorded data for future routine maintenance and trouble-shooting.
   3. Provide assurance that each system component is installed satisfactorily and can be expected to perform, and continue to perform its specified function with reasonable reliability throughout the life of the facility.
C. At any stage of construction and when observed, any electrical equipment or system determined to be damaged, or faulty, is to be reported to the Engineer. Corrective action by the Contractor requires prior Engineer approval, retesting, and inspection.
D. When the electrical tests and inspections specified or required within Division 16 are completed and results reported, reviewed, and approved by the Engineer, the Contractor may consider that portion of the electrical equipment system or installation electrically complete. The Contractor will then affix appropriate, approved, and dated completion or calibration labels to the tested equipment and notify the Engineer of electrical completion. If the Engineer finds completed work unacceptable, he will notify the Contractor in writing of the unfinished or deficient work, with the reason for his rejection, to be corrected by the Contractor. The Contractor will notify the Engineer in writing when exceptions have been corrected. The Contractor will prepare a "Notification or Substantial Electrical Completion" for approval by the Engineer following Engineer's acceptance of electrical completion. If later in-service operation or further testing identified problems attributable to the Contractor, these will be corrected by the Contractor, at no additional cost to the Authority.
E. Grounding Systems:
   1. Test main building loops and major equipment grounds to remote earth, directly referenced to an extremely low resistance (approximately 1 ohm) reference ground benchmark. Perform a visual inspection of the systems, raceway and equipment grounds to determine the adequacy and integrity of the grounding. Ground testing results shall be recorded, witnesses, and submitted to the Engineer.
   2. Perform ground tests using a low resistance, null-balance type ground testing ohmmeter, with test lead resistance compensated for. Use the type of test instrument which compensates for potential and current rod resistances.
   3. Test each ground rod and measure ground resistance. If resistance is not 10 ohms or less, drive additional rods to obtain a resistance of 10 ohms or less. Submit tabulation of results to Engineer. Include identification of electrode, date of reading and ground resistance valve in the test reports.
   4. Test each building and major equipment grounding system for continuity of connections and for resistance. Ground resistance of conduits, equipment cases, and supporting frames, shall not exceed 5 ohms to ground. Submit all readings to the Engineer.
   5. Where ground test results identify the need for additional grounding conductors or rods that are not indicated or specified, design changes will be initiated to obtain the acceptable values. The Contractor is responsible for the proper installation of the grounding indicated and specified.

6. Operating Instructions: Furnish operating instructions to Owner's designated representative with respect to operations, functions and maintenance procedures for equipment and systems installed. Cost of such instruction up to a full five (5) days of Electrical Subcontractor's time shall be included in contract. Cost of providing a Manufacturer's Representative at site for instructional purposes shall also be included.

3.3 BRANCH CIRCUITRY

A. For all lighting and appliance branch circuitry, raceway sizes shall conform to industry standard maximum permissible occupancy requirements except where these are exceeded by other requirements specified elsewhere.
B. Circuits shall be balanced on phases at their supply as evenly as possible.
C. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.
D. Reduced size conductors indicated for any feeders shall be taken as their grounding conductors.
E. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one (1) cable for each leg and one (1) neutral cable, if any.
F. For circuitry indicated as being protected at 20 Amps or less, abide by the following:
   1. All 20 amp, 120/208 volt, 3-phase, 4-wire combined branch circuit homeruns shall be provided with a #8 AWG neutral conductor.
   2. Minimum conductor size shall be No. 12 AWG cooper.
   3. Conductors operating at 120 volts extending in excess of 100 ft. or at 277 volts extending in excess of 200 ft., or the last outlet or fixture tap shall be No. 10 AWG cooper throughout.
   4. Lighting fixtures and receptacles shall not be connected to the same circuit.
G. Type MC Cable Installation:
   1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:
      a. Cable shall be supported in accordance with code. Tie wire is not an acceptable means of support. Cable supports such as Caddy WMX-6, MX-3, and clamps such as Caddy 449 shall be used. Where cables are supported by the structure and only need securing in place, then ty-raps will be acceptable. Ty-raps are not acceptable as a means of support. All fittings, hangers, and clamps for support and termination of cables shall be of type specifically designed for use with cable, i.e., romex connectors not acceptable.
      b. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek Co.; not with a hacksaw.
      c. Use split "Insuliner" sleeves at terminations.

3.4 REQUIREMENTS GOVERNING ELECTRICAL WORK IN DAMP OR WET LOCATIONS

A. Outlets and outlet size boxes shall be of galvanized cast ferrous metal only.
B. The finish of threaded steel conduit shall be galvanized only.
C. Wires for pulling into raceways for lighting and appliance branch circuitry shall be limited to "THWN".
D. Wires for pulling into raceways for feeders shall be limited to "THWN".
E. Plates for toggle switches and receptacles shall have gasketed snap shut covers suitable for wet locations while in use.
F. Final connections of flexible conduit shall be neoprene sheathed.
G. Apply one (1) layer of half looped plastic electric insulating tape over wire nuts used for joining the conductors of wires.
H. Enclosures, junction boxes, pull boxes, cabinets, cabinet trims, wiring troughs and the like, shall be fabricated of galvanized sheet metal, shall conform to the following:
   1. They shall be constructed with continuously welded joints and seams.
   2. Their edges and weld spots shall be factory treated with cold galvanizing compound.
   3. Their connection to circuitry shall be by means of watertight hub connectors with sealing rings.

I. Enclosures for individually mounted switching and overcurrent devices shall be NEMA Class IV weatherproof construction.
J. The covers, doors and plates and trims used in conjunction with all enclosures, pull boxes, outlet boxes, junction boxes, cabinets and the like shall be equipped with gaskets.
K. Panels shall be equipped with doors without exception.
L. The following shall be interpreted as damp or wet locations within building confines:
   1. Spaces where any designations indicating weatherproof (WP) or vapor proof appear on the drawings.
   2. Below waterproofing in slabs applied directly on grade.
   3. Spaces defined as wet or damp locations by Article 100 of the National Electric Code.
   4. Parking garage.

3.5 REQUIREMENTS GOVERNING ELECTRIC WORK IN AIR HANDLING SPACES

A. Within air handling ductwork or plenums (other than spaces within suspended ceilings used for air handling purposes), Area “B” and the media shall comply with requirements for return air plenums.
B. Abide by the requirements specified for electric work in damp locations within building confines.
C. Where circuitry passes through duct walls, include, in accordance with instructions issued in the field, airtight sealing provisions which allow for a relative movement between the circuitry and the duct walls.
D. Exclude the installation of type NM or NMC cable.
E. In spaces within suspended ceilings used for air handling purposes, abide by the requirements specified for normal electric work conditions except:
F. Lighting fixtures recessed into the ceilings shall be certified as being suitable for this purpose.

3.6 LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION

A. Perform the following work, in accordance with field instructions issued by the Architect to assure that minimal noise is produced by electrical installations due to equipment furnished as part of the electrical work.
B. Check and tighten the fastenings of sheet metal plates, covers, doors and trims used in the enclosures of electrical equipment.
C. Remove and replace any individual device containing one or more magnetic flux path metallic cores (e.g., discharge lamp ballast, transformer, reactor, dimmer, and solenoid) which is found to have a noise output exceeding that of other identical devices installed at the project.

3.7 SUPPORTS AND FASTENINGS

A. Support work in accordance with best industry standards, and Local Electric Code.
B. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free standing position.
C. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braces to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.
D. No work intended for exposed installation shall be mounted directly on any building surface. In such locations, flat bar members or spaces shall be used to create a minimum of ¼” air space between the building surfaces and the work. Provide ¾” thick exterior grade plywood painted with two (2) coats of fire-retardant gray paint for mounting of panelboards.
E. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways or cables for support.
F. Nothing shall rest on, or depend for support on, suspended ceiling media.
G. Support less than 2” trade size, vertically run, conduits at intervals no greater than 8’. Support such conduits, 2-1/2” trade size or larger, at intervals no greater than they story height, or 15’, whichever is smaller.

H. Where they are not embedded in concrete, support less than 1" trade size, horizontally run, conduits at intervals no greater than 7'. Support such conduits, 1" trade size or larger, at intervals no greater than 10'.
I. Support all lighting fixtures directly from structural slab, deck or framing member.
J. Where fixtures and ceilings are such as to require fixture support from ceiling openings frames, include in the electric work the members necessary to tie back the ceiling opening frames to ceiling suspension members or slabs so as to provide actual support for the fixtures noted above.
K. As a minimum procedure, in suspended ceilings support smalls runs of circuitry (e.g., conduit not in excess of 1" trade size) from ceiling suspension members as defined above. Support larger runs of circuitry directly from structural slabs, decks or framing members.
L. Fasten electric work to building structure in accordance with the best industry practice.
M. Floor mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastenings in all cases.
N. For items which are shown as being ceiling mounted at locations where fastenings to the building construction element above is not possible, provide suitably auxiliary channel or angle iron bridging tying to building structural elements.
O. As a minimum procedure, where weight applied to the attachment points is 100 lbs. or less, fasten to concrete and solid masonry with bolts and expansion shields.
P. As a minimum procedure, where weight applied to building attachment points exceed 100 lbs., but is 300 lbs. or less, conform to the following:
    1. At field poured concrete slabs, utilize inserts with 20' minimum length slip-through steel rods, set transverse to reinforcing steel.

3.8 SPLICING AND TERMINATING WIRES AND CABLES

A. Maintain all splices and joints in removable cover boxes or cabinets where they may be easily inspected.
B. Locate each completed conductor splice or joint in the outlet box, junction box, or pull box containing it, so that it is accessible from the removal cover side of the box.
C. Join solid conductors No. 8 AWG and smaller by securely twisting them together and soldering, or by using insulated coiled steel spring "wire nut" type connectors. Exclude "wire nuts" employing non-expandable springs. Terminate conductors No. 8 AWG and smaller by means of a neat and fast holding application of the conductors directly to the binding screws or terminals of the equipment or devices to be connected.
D. Join, tap and terminate standard conductors No. 6 AWG and larger by means of solder sleeves, taps, and lugs with applied solder or by means of bolted saddle type or pressure indent type connectors, taps and lugs. Exclude connectors and lugs of the types which apply set screws directly to conductors. Where equipment or devices are equipped with set screw type terminals which are impossible to change, replace the factory supplied set screws with a type having a ball bearing tip. Apply pressure indent type connectors, taps and lugs utilizing tools manufactured specifically for the purpose and having features preventing their release until the full pressure has been exerted on the lug or connector.
E. Except where wire nuts are used, build up insulation over conductor joints to a value, equal both in thickness and dielectric strength, to that of the factory applied conductor insulation. Insulation of conductor taps and joints shall be by means of half-lapped layers of rubber tape, with an outer layer of friction tape; by means of half-lapped layers of approved plastic electric insulating tape; or by a means of split insulating casings manufactured specifically to insulate the particular connector and conductor, and fastened with stainless steel or non-metallic snaps or clips.

3.9 PULLING WIRES INTO CONDUITS AND RACEWAYS

A. Delay pulling wires or cables in until the project has progressed to a point when general construction procedures are not liable to injure wires and cables, and when moisture is excluded from raceways.

B. Utilize nylon snakes or metallic fish tapes with ball type heads to set up for pulling. In raceways 2" trade size and larger, utilize a pulling assembly ahead of wires consisting of a suitable brush followed by a 3-1/2" diameter ball mandrel.
C. Leave sufficient slack on all runs of wire and cable to permit the secure connection of devices and equipment.
D. Include circular wedge-type cable supports for wires and cables at the top of any vertical raceway longer than 20 feet. Also include additional supports spaced at intervals which are no greater than 10'. Supports shall be located in accessible pull boxes. Supports shall be of a non-deteriorating insulating material manufactured specifically for the purpose.
E. Pulling lubricants shall be used. They shall be products manufactured specifically for the purpose.

3.10 REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET BOXES AND PULL BOXES

A. Flush wall-mounted outlet boxes shall not be set back to back but shall be offset at least 12" horizontally regardless of any indication on the drawings.
B. Locate all boxes so that their removable covers are accessible without necessitating the removal of parts of permanent building structure, including piping, ductwork, and other permanent mechanical elements.
C. In conjunction with concealed circuitry, abide by one of the following instructions (as may be applicable to the conditions) in order to assure the aforementioned accessibility. (Not required for circuitry concealed by removable suspended ceiling tiles.)
D. For a small (outlet size) box on circuitry concealed in a partition or wall, locate box or fitting so that its removable cover side, (or the face of any applied raised cover) penetrates through to within 1/8" of the exposed surface of the building materials concealing the circuitry and apply a blank or device plate to suit the functional requirements.
E. For a large box on circuitry concealed in a partition, suspended ceiling, or wall, locate box totally hidden but with its removable cover directly behind an architectural access door or panel (included for the purpose, separate from the electric work) in the building construction which conceals the circuitry.
F. Include all required junction and pull boxes regardless of indications on the drawings (which, due to symbolic methods of notation, may omit to show some of them).
G. Unless noted below or otherwise specifically indicated, include a separate outlet box for each individual wiring device, lighting fixture and signal or communication system outlet component. Outlet boxes supplied attached to lighting fixtures shall not be used as replacements for the boxes specified herein.
H. Utilize an outlet box no smaller than 5" square by 2-1/2" deep.
I. Allow no fixture to be supplied from an outlet box in another room.
J. Multiple local switches indicated at a single location shall be gang-mounted in a single outlet box.
K. Install junction boxes, pull boxes and outlet boxes in conjunction with concealed circuitry.
L. Close up all unused circuitry openings in outlet boxes. Unused openings in cast boxes shall be closed with approved cast metal threaded plugs. Unused openings in sheet metal boxes shall be closed with sheet metal knock-out plugs.
M. Outlet boxes for switches shall be located at the strike side of doors. Indicate door swings are subject to field change. Outlet boxes shall be located on the basis of final door swing arrangements.
N. Boxes and plaster covers for duplex receptacles shall be arranged for vertical mounting of the receptacle.
O. Equip outlet boxes used for devices which are connected to wires of systems supplied by more than one set of voltage characteristics with barriers to separate the different systems.
P. Barriers in junction and pull boxes of outlet size shall be of the same metal as the box.
Q. Barriers in junction and pull boxes which are larger than outlet size shall be of the polyester resin fiberglass of adequate thickness for mechanical strength, but in no case less than 1/4" thick. Each barrier shall be mounted, without fastenings, between angle iron guides so that they may be readily removed.

3.11 LOCATING AND ROUTING OF CIRCUITRY

A. In general, all circuitry shall be run concealed except that it shall be run exposed where the following conditions occur:
   1. Horizontally at the ceiling of permanently unfinished spaces which are not assigned to mechanical or electrical equipment.
   2. Horizontally and vertically in mechanical equipment spaces.
   3. Horizontally and vertically in electric equipment rooms.
B. Concealed circuitry shall be so located that building construction materials can be applied over its thickest elements without being subject to spalling or cracking.
C. All circuitry and raceways shall not be run within slabs. If field conditions requires raceways to be embedded in field-poured structural building construction concrete fill or slab shall conform to the following:
   1. Where turned up or down into a wall or partition they shall, before entering same, be routed parallel for a long enough distance to assure that no relocation of the wall or partition will be necessary to conceal the required bend.
   2. They shall be routed in such a manner as to coordinate with the structural requirements of the building.
   3. They shall be routed in accordance with field instructions issued by the Architect where such instructions differ from specifications set forth herein.
D. Circuitry run exposed shall be routed parallel to building walls and column lines.
E. Circuitry shall be routed so as to prevent electric conductors from being subject to high ambient temperature. Minimum clearances from heated lines or surfaces shall be maintained as follows:
   1. Crossing where uninsulated: 3”.
   2. Crossing where insulated: 1”
   3. Running parallel where uninsulated: 36”.
   4. Running parallel where insulated: 6”.
F. Circuitry shall not be run in elevator shafts, hoistways, and the like. Where outlets for trail cables, pit lights, run be level lights, and the like, are involved, only the “final connection” outlet boxes themselves shall be located within or open into, the confines of the shaft.

3.12 INSTALLING CIRCUITRY

A. The outside surface of circuitry, which is to be embedded in cinder concrete, shall be coated with asphaltum paint.
B. In runs of conduit or raceway including flexible limit the number of bends between cable access points to a total which does not exceed the maximum specified for the particular system. Where no such maximum is specified, limit the number to four (4) right angle bends or the equivalent thereof.
C. In each conduit or raceway assigned for the future pulling in of wires, include a nylon drag cord. In raceways 2” trade size and larger, the cord shall be pulled in utilizing a suitable brush, followed by an 85% diameter ball mandrel ahead of the cord in the pulling assembly. In the event that obstructions are encountered, which will not permit the drag cord to be installed, the blocked section of raceway shall be replaced and any cutting and patching of the structure involved in such replacement shall be included as part of the electric work.
D. Circuitry shall be arranged such that conductors of one feeder or circuitry carrying “going” current are not separated from conductors of the same feeder or circuitry carrying “return” current by any ferrous or other metal. Where not within raceways, all “going” and “return” current conductors of one feeder or circuit shall be laced together so as to minimize induction heating of adjacent metal components.
E. Sleeves used where circuitry is to penetrate waterproof slabs, decks and walls, shall be of a type selected to suit the water condition encountered in the field.

END OF SECTION