LEROY COLLINS LEON COUNTY PUBLIC LIBRARY SYSTEM

LAKE JACKSON BRANCH LIBRARY

LEON COUNTY COMMUNITY CENTER

HUNTINGTON OAKS SHOPPING CENTER RENOVATIONS

TECHNICAL SPECIFICATIONS
AUGUST 2011

LeRoy Collins Leon County Public Library System - Lake Jackson Library
Leon County Community Center
Huntington Oaks Shopping Center Renovations

Non Technical Specifications & Technical Specifications

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AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
LeRoy Collins Leon County Public Library System Lake Jackson Branch Library, Leon County Community Center & Huntington Oaks Shopping Center

THE OWNER:
(Name, legal status and address)
Leon County Facilities
1907 A South Monroe Street
Tallahassee, FL 32301

THE ARCHITECT:
(Name, legal status and address)
Johnson Peterson Architects, Inc.
930 Thomasville Road Suite 100
Tallahassee FL 32303

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or

the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other

facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume

the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be

required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate For Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION
Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may

be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that

the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2., for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a separate contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect,

stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the

Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents; or
- **.3** terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- **.1** Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- **.2** Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- **.3** Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- **.4** Claims for damages insured by usual personal injury liability coverage;
- **.5** Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- **.6** Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- **.7** Claims for bodily injury or property damage arising out of completed operations; and
- **.8** Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction

of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's Consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or

otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE
The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE
The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION
The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the

Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES
The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION
§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an

additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

SUPPLEMENT TO THE
AGREEMENT FOR GENERAL CONTRACTOR'S SERVICES

1 Scope

A. The information and requirements contained in this section are a supplement to and a part of the Agreement for General Contractor's Services.

2 Contract Documents

The term "Contract Documents" includes the following:

1. Leon County Invitation to Bid issued in conjunction with this project.
2. Leon County Agreement for General Contractor's Services issued in conjunction with this project.
3. General conditions of the Contract for Construction, American Institute of Architects Document A201-2007, issued in conjunction with this project.
4. This Supplement to the Agreement for General Contractor's Services.
5. Drawings as enumerated on the Drawings.
6. Specifications as enumerated in the Specifications.

These Contract Documents supersede prior negotiations and agreements.

3 Other Leon County Requirements

A. Comply with the preferences and requirements listed in the Leon County Facilities Design Guidelines. Copies of this manual are available on the Owner's web site.

4 Modifications to the General Conditions

A. This Section sets forth modifications to the General Conditions of the Contract for Construction A1A Document A201-2007.

Modify as follows:

Article 1.1.1 Delete its entirety.

Article 2.1.2 Delete its entirety.

Article 2.2.1 Delete its entirety.

Article 3.3.2 - Add the following: "Should the Architect-Engineer find any person(s) employed on the project incompetent, unfit or otherwise objectionable for his duties and so certify the facts to the Contractor, the Contractor shall immediately cause the employee to be dismissed and said employee shall not be re-employed on this project without written consent of the Architect-Engineer."

Article 3.8.1 - Add the following: "If directed by the Architect- Engineer the Contractor shall solicit not less than three bids for the item(s), the cost of which is provided for by a specified allowance sum. The Contractor shall purchase the item(s) from one of the three Bidders as directed by the Architect-Engineer."

Article 3.14.1 - Add the following: "All cutting and patching work shall blend in and be plumb and square. The quality of materials used shall be the same or surpass those used in the adjacent existing construction."

Article 4.1.1 - Delete in its entirety and add the following: "The Architect-Engineer is the design professional identified in the Owner- Contractor Agreement. Throughout the contract documents, the Architect-Engineer is referred to as if singular in number and masculine in gender. The terms Architect and Architect-Engineer mean the Architect-Engineer or his authorized representative."

Article 4.2.12 - Delete end of last sentence: "and will not be liable for the result of any interpretation or decision rendered in good faith."

Article 5.2.1 - Add the following: "The Contractor shall not remove or replace subcontractors listed in his bid subsequent to the lists being made public at the bid opening, except upon good cause shown and only when approved in writing by the Owner."

Article 7.1 – Delete in its entirety and replace with the following:

Article 7.1.1- During the course of the Contractor's performance of the work necessary to complete the subject Project, certain events may occur which have the effect of changing the conditions under which the work is to be performed as specified and described in the Bidding Documents, and/or the nature and extent of the work as specified and described in the Bidding Documents. The occurrence of such events may cause the Contractor to incur greater or less cost and expense to perform the work required to complete the subject Project than planned to be incurred in the Contractor's successful bid, in which event the Contractor or the Owner shall respectively be entitled to either an increase or decrease in the Contract Sum, whichever is the case, to the extent such greater or less cost and expense results, and in which event the party entitled to the benefit of any such adjustment to the Contract Sum shall, within twenty-one (21) calendar days from the first occurrence of such event(s), present written demand therefore on the other party through the Owner. Should the Contractor and Owner be unable to settle and dispose of such demand within thirty (30) calendar days from the date any such claim is presented, upon terms and conditions mutually agreeable to the Contractor, then such demand shall be referred to the Owner for determination, which determination shall be final and binding upon the Contractor, unless appealed in accordance with applicable provisions of the Contract Documents, and if the Owner, upon considering any such demand, determines that the Contract Sum should be increased or decreased, the Owner's determination of the amount of any such increase or decrease in the Contract Sum shall be governed and controlled by strict adherence to the following described guidelines and limitations, and neither the Contractor or the Owner shall be entitled to receive any monetary consideration beyond that which is authorized herein below.

Article 7.2.2 - All adjustments to the Contract Sum resulting from a change in the work shall be determined by the measure of actual or estimated as the case may be, out-of-pocket costs and expenses incurred or spared by the Contractor for labor, materials, equipment, and equipment rental, plus overhead and profit thereon, for performing the changed work.

1) Labor costs shall be inclusive of all direct job site cost for estimation, laying out, mechanics' wages and laborers' wages, together with all payroll taxes, payroll assessments, and insurance premiums paid for such labor.

2) All material costs, equipment costs and equipment rental costs shall be trade discount rates, plus State Sales Tax, where applicable.

3) Overhead and profit shall be inclusive of all project management, project administration, superintendence, project coordination, project scheduling and other administrative support functions and services, whether performed on the job site or off the job site and general support equipment. Overhead and profit shall be determined as follows:

1. Overhead and profit shall be calculated at the rate of 15% of the Contractor's labor, material, equipment and equipment rental costs, incurred or spared, as measured under the preceding paragraphs for changes in the work performed by the officers, employees or subsidiaries of the Contractor.

2. Overhead and profit shall be calculated at the rate of 7 1/2 percent of the Contractor's sub-contractors' actual labor, material, equipment and equipment rental costs, incurred or spared, as measured under the preceding paragraphs, plus 15% of all such costs, as overhead and profit to the Contractor's subcontractors, for all changes in the work performed by the officers, employees or subsidiaries of the Contractor's sub-contractors.

4) In addition to the foregoing, all adjustments to the Contract Sum resulting from a change in the work shall include all out-of-pocket expenses, incurred or spared, in performing the changes in the work for:

   1. Paying the premiums required to obtain Performance Bonds and Labor and Material Payment Bonds called for by the Contract Documents;

   2. Paying the fee(s) required for licenses or permits called for by changes in the work;

   3. Paying for delivery of materials or equipment to the job site;

   4. Paying for storage of materials or equipment before use thereof in performing changes in the work, and

   5. Paying for testing required by the changes in the work.

5) In the event Contractor demands an adjustment in the Contract Sum, such demand shall be accompanied by paid receipts or other such written evidence satisfactory to the Owner itemizing the costs and expenses incurred as a result of the event(s) constituting the changes in the work.

Article 8.3.1 – Delete the words “or by delay authorized by Owner pending arbitration.”

Article 8.3.3 - Delete in its entirety and replace with the following:

Article 8.3.3 of the AIA General Conditions is deleted and Contractor's remedies for delays the progress of the Work, or for changes in the Work, shall be limited to those provided in this Article. The contractor's exclusive remedy for delays in performance of the contract caused by events beyond its control shall be a claim for equitable adjustment in the contract time; provided, however, inasmuch as the parties expressly agree that overhead cost incurred by Contractor for delays in performing the Work cannot be determined with any degree of certainty, it is hereby agreed that in the event the Contractor is delayed in the progress of the Work after Notice to Proceed to Mobilize on Site and to Proceed with Construction for causes beyond its control <u>and</u> attributable only to acts or omissions of Owner, Contractor shall be entitled to compensation for overhead cost and profit either (a) as a fixed percentage of the actual cost of the change in the Work, if the delay results from a change in the Work, as calculated in Section C, "Conditions of the Contract", or (b) if the delay results from other than a change in the Work, at an amount for each day of delay calculated by dividing an amount equal to a percentage of the original contract sum determined on the graph enclosed as Exhibit 14 by the number of calendar days of the original contract time.

In the event of a change in the Work, Contractor's claim for adjustments in contract sum are limited exclusively to its actual costs for such changes plus fixed percentages for overhead, additional profit and bond costs, as specified herein.

The forgoing remedies for delays and changes in the Work are to the exclusion of, and thus eliminate, the total cost concept (that is, computing Contractor's additional costs for changes in Work or the costs of a delay in the progress of the Work by comparing Contractor's total actual costs with its original estimate, see <u>McDevitt & Street Company v. Department of Management Services State of Florida</u>, 377 So.2d 191, (Fla. 1st-DCA 1979)) as method of determining Contractor's costs associated with a change in the Work or with delay in the progress of the Work.

No provision of this contract shall be construed as a waiver of sovereign immunity by the Owner.

Article 9 - Delete in its entirety and replace with the following:

The Owner will, at intervals, pay or cause to be paid to the Contractor as follows:

Payments to Contractors

Thirty (30) calendar days shall be allowed for the Owner's inspection and approval of the goods and services for which any Application for Payment is made.

1. Indemnification Rider - In addition to the Contract Sum, the Owner shall pay the Contractor ten dollars ($10.00) for the indemnification Rider prescribed in Section C-4 hereinabove. Application for Payment of the ten dollars ($10.00) shall be submitted to the Owner by the Contractor simultaneously with the Contractor's execution and delivery of the Contract to the Owner. Within thirty (30) calendar days from the Owner's receipt of said Application, the Owner shall pay or cause to be paid to the contractor the amount of ten dollars ($10.00).

2 Progress Payments Against Contract Sum - Based upon Application for Payment submitted to the Architect-Engineer by the Contractor and Certificates of Payment issued by the Architect-Engineer and accepted by the Owner, the Owner shall make progress payments to the Contractor against the account of the Contract Sum in accordance with the following:

(1) Within thirty (30) calendar days from the Owner's receipt and acceptance of a certificate of payment, the Owner shall pay, or cause to be paid to the Contractor, 90% of the portion of the contract sum properly allocable to labor, materials and equipment incorporated into the work, and 90% of that portion of the contract sum properly allocable to materials and equipment suitably stored at the site or at some other locations agreed upon in writing by the parties, less the aggregate of previous payments. However, at the time the work is 50% complete or thereafter, if the manner of completion of the work and its progress are and remain satisfactory to the Architect-Engineer, the Architect-Engineer may authorize a 5% retainage on progress payments. The full 10% retainage may be reinstated if the manner of completion of the work and its progress do not remain satisfactory to the Architect-Engineer or for other good and sufficient reasons.

(a) The Contractor shall promptly pay each Subcontractor in accordance with Section 287.0585, Florida Statutes, upon receipt of payment from the Owner out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractor's work

(b) The Architect-Engineer may, on request at his discretion, furnish to a Subcontractor, if practical, information regarding the percentages of completion of the amount applied for by the Contractor and the action taken thereon by the Architect-Engineer on account of Work done by such Subcontractor

(c) Neither the Owner nor the Architect-Engineer shall have any obligation to pay or to see to the payment of any monies to any Subcontractor except as may otherwise be required by law.

(d) No Certificate for a progress payment, nor any progress payment, nor any partial or entire use of occupancy of the project by the Owner, shall constitute an acceptance of any work not in accordance with the Contract Documents.

1. The Contractor shall request such compensation by submitting:

(1) A properly completed and notarized Application for Progress Payment on the form enclosed as Exhibit 11.

(2) A properly completed Contractor's Minority Business Enterprises Status Report of Partial Payment on the form enclosed as Exhibit 18. This form must be submitted even if no minorities were utilized.

(3) A schedule of Contract Values as described below.

The Contractor shall, within ten (10) calendar days from date of Agreement, submit to the Architect-Engineer for approval three copies of a Schedule of Contract Values which will reflect the estimated cost of each subdivision of work of each specification section, further detailed by Subcontractor item, and utilizing the Construction Specification's Institute "Masterformat Broadscope Section Numbers". The value of each item shall include a true proportionate amount of the Contractor's overhead and profit. The sum of all such scheduled values shall equal the Contract Sum as evidenced by the Agreement.

The approved Schedule of Contract Values will accompany and support the Contractor's periodic Applications for Payment and shall indicate the value of suitably stored material as well as labor performed and materials incorporated into the work for each subdivision of the schedule during the period for which the requisition is prepared.

The Schedule of Contract Values form enclosed as Exhibit 12 will be utilized to present this and other pertinent information which will facilitate the checking and processing by the Owner's representatives of the Contractor's Application for Payment.

Article 11 - Delete in its entirety.

Article 13.5.1 - Delete last sentence: "the Owner shall bear cost of tests, inspections or approvals which do not become requirements until after bids are received or negotiation concluded ." and add; "The Architect-Engineer shall designate the tests which shall be made, and the Contractor shall not obligate the Owner for tests without the Architect-Engineer's approval."

Testing Costs Paid For by the Contractor
Certain tests of materials, equipment and systems are required as part of the contract and shall be paid for by the Contractor. These are specifically named in the technical specifications and the types of tests are as follows:

1) Where tests are required by the technical specifications for materials, methods or equipment, the Contractor shall pay the cost of initial tests to prove qualities and determine conformance with specification requirements, e.g., mill tests on cement and steel; load testing of piling; sieve analysis and calorimetric tests on sand; strength tests for determining proportions of materials or concrete, moisture content and sound transmission tests of concrete blocks, etc;

2) If substitute materials or equipment are proposed by the Contractor, he shall pay the cost of all tests which may be necessary to satisfy the Architect-Engineer that specification requirements are satisfied;

3) If materials or workmanship are used which fail to meet specification requirements the Contractor shall pay the costs of all coring or other tests deemed necessary by the Architect-Engineer to determine the safety or suitability of the material or element;

4) The Contractor shall pay for all testing costs, including but not limited to; power, fuel, and equipment and systems for proper operation such as plumbing, heating ventilation, air conditioning, electrical, elevator, dumbwaiters and conveyors, etc.

Testing Costs Borne by the Owner
All other tests performed at the direction of the Architect-Engineer or the Owner shall be paid for by the Owner, except to the extent that the costs of performing such tests are otherwise chargeable to the Contractor under provisions of the Contract Documents.

Article 13.6 - Delete in its entirety.

Article 13.7 - Delete in its entirety.

Article 15 – Delete in its entirety and replace with the following:

Claims and Disputes

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the claim.

No provision of the Contract Documents makes or is intended to make provision for recovery by Contractor of damages for delay or for breach of contract. All claims, disputes or controversies under this contract shall be determined and settled as provided in Section C-41 hereinafter. No claim for breach of contract shall be submitted, determined or settled under Section C-41 hereinafter.

Time Limits on Claims
Claims by either party must be made within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice. An additional Claim made after the initial Claim has been implemented by Change Order will not be considered unless submitted in a timely manner.

Continuing Contract Performance
Pending final resolution of a Claim unless otherwise agreed in writing the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

The provisions of Chapter 28-106, Florida Administrative Code to the extent not inconsistent with this Article are referred-to and adopted by reference and shall govern procedures for claims.
Under the terms of this Agreement, the Contractor shall not have any right to compensation other than, or in addition to, that provided by this Agreement, to satisfy any claim for costs, liabilities or debts of any kind whatever resulting from any act or omission attributable to the Owner unless the Contractor has provided notice as required by Section C-36 and unless the claim therefore is delivered to the Owner. All such claims shall be set forth in a petition stating:

1. Name and business address of the claimant,

2. A concise statement of the ultimate facts, including the statement of all disputed issues of material fact, upon which the claim is based.

3. A concise statement of the provisions of the contract together with any federal, state and local laws, ordinances or code requirements or customary practices and usage's in the industry asserted to be applicable to the questions presented by the claim and a demand for the specific relief believed to be due the claimant, and

4. The date of the occurrence of the event giving rise to the claim and the date and manner of Contractor's compliance with the notice requirements of Section C-36.

Within thirty (30) calendar days from the date any such claim is received, the Owner shall deliver to the Contractor its written determination on the claim. Unless the Owner's determination is agreed to by the Contractor and a consent order adopting the determination is entered within thirty (30) days of receipt of the Owner's determination, the Owner shall designate a hearing officer who shall conduct a proceeding in accordance with Chapter 28-106, F.A.C.

The Contractor shall carry on the Work and maintain the progress schedule during any administrative proceeding unless otherwise agreed by the Contractor and the Owner in writing.

The venue for all civil and administrative actions against the department shall be in Leon County, unless otherwise agreed by the parties.

C EXCLUSION OF OWNER FROM LIABILITY

Notwithstanding any other provision of the Contract Documents, should the Contractor sustain loss or be damaged by act or omission of a separate Contractor, the Owner shall not be liable for any such loss or damage and the Contractor shall not be entitled to obtain any monetary relief from the Owner to compensate for any such loss or damage, but shall be limited to such recovery as is otherwise available at law from persons and/or entities other than the Owner.

D PROHIBITED MATERIALS - ASBESTOS

Per Section 255.40, Florida Statutes, the use of asbestos or asbestos-based fiber materials is prohibited in any buildings, construction of which is commenced after September 30, 1983, which is financed with public funds or is constructed for the express purpose of being leased to any government entity.

E INTEREST PROVISIONS

Any monies not paid when due to either party under this Agreement shall not bear interest except as may be required by Section 215.422(3)(b), Florida Statutes.

F HARMONY

Contractor is advised and hereby agrees that he will exert every reasonable and diligent effort assure that all labor employed by Contractor and his Subcontractors for Work on the project shall work in harmony with and be compatible with all other labor being used by building and construction contractors now or hereafter on the site of the project.
Contractor further agrees that this provision will be included in all subcontracts of the Subcontractor as well as in the Contractor's own contract; provided, however, that this provision shall not be interpreted or enforced so as to deny or abridge, on account of membership or non-membership in any labor union or labor organization, the right of any person to work as guaranteed by Article 1, Section 6 of the Florida Constitution.

H TERMINATION FOR CAUSE OR MUTUAL AGREEMENT

This Agreement may be terminated by either party upon seven (7) days' notice by mutual agreement, or should one party fail substantially to perform in accordance with its terms through no fault of the other. Also, this Agreement may be unilaterally terminated by the Owner for refusal by the Contractor to allow public access to all documents, papers, letters, or other material subject to the provisions of Chapter 119, Florida Statutes, and made or received by the Contractor in conjunction with this Agreement. In the event of termination, due to the fault of others than the Contractor, the Contractor shall be paid for services performed to termination date, including reimbursements then due plus terminal expense.

I TERMINATION FOR CONVENIENCE

The performance of work under this contract may be terminated by the Owner in accordance with this clause in whole, or from time to time in part, whenever the Owner shall determine that such termination is in the best interest of the Owner. Upon termination, the contractor shall be entitled to payment and profit for Work completed to the time of termination, only. The percentage of completion shall be determined by the Architect/Engineer, based upon the approved Schedule of Values.

J CONTRACTOR PAYMENT RIGHTS

Contractors providing goods and services to the Owner should be aware of the following time frames. Upon receipt, the Owner has thirty (30) days to inspect and approve the goods and services. (see Article 6 herein above). The Owner has twenty (20) days to deliver a request for payment (voucher) to the Department of Banking and Finance. The 20 days are measured from the latter of the date the Pay Request is received or the goods or services are received, inspected and approved.

If payment is not available to the Owner for transmittal to the Contractor within 40 days, a separate interest penalty of .03333 percent per day will be due and payable, in addition to the Pay Request amount, to the vendor. The 40 days are also measured from the latter of the date the invoice is received or the goods or services are received, inspected and approved. Interest penalties of less than one (1) dollar will not be enforced unless the Contractor requests payment. Pay Requests which have to be returned to a Contractor because of Contractor preparation errors will result in a delay in the payment. The Pay Requests payment requirements do not start until a properly completed Pay Request is provided to the Owner.

A Vendor Ombudsman has been established within the Department of Banking and Finance. The duties of this individual include acting as an advocate for vendors who may be experiencing problems in obtaining timely payment(s) from a state agency. The Vendor Ombudsman may be contacted at 850) 410-9354 or by calling the State Comptroller's Hotline, 1-800-848-3792.

K WATER

Water necessary for construction of the building and testing its plumbing and mechanical systems shall be furnished by the Contractor. He shall make all connections, install a meter, take out and pay for all permits necessary, do all piping and clear away all evidence of same after the job is completed.

L ELECTRICITY

All electricity for light and power necessary for the construction of the building and testing of its electrical and mechanical systems shall be paid for by the Contractor. He shall make all necessary arrangements for this service and perform the work required.

M INITIAL CONSTRUCTION CONFERENCE

Immediately prior to starting construction or as soon as possible after the construction has started, the Owner's Project Director will arrange a meeting with the Design Professional, State Agency that will occupy the project, General Contractor, Federal Representatives if involved, Bureau of Apprenticeship and other interested parties. The purpose of this meeting shall be to discuss requirements and responsibilities of the various parties involved with the objective of expeditious handling of the construction contract. The Owner's Project Director will chair this meeting.

N SITE SECURITY

The Contractor shall pay for and be responsible to secure the site and the project against theft, vandalism, fire and public safety at all times (24 hours per day) from Notice to Proceed until Substantial Completion.

End of Supplement to the Agreement

SECTION 01000 – SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: LeRoy Collin Leon County Public Library System; Lake Jackson Branch, Leon County Community Center and Huntington Oaks Shopping Center Renovations

B. Owner's Name: Leon County Board of County Commissioners, through the Leon County Facilities Management & Construction Division, 907 South Monroe Street, Tallahassee, Florida 32301. Project Manager John Ward, AIA.

C. Architect's Name: Johnson Peterson Architects, Inc., 930 Thomasville Road Suite 100, Tallahassee, Florida 32303. Architect of Record: Ivan Johnson, AIA.

D. Phase IA: This phase consists of the renovation of +/- 12,000 square foot portion of a former grocery store into a public library. The existing building is located in the Huntington Oaks Shopping Center, North Monroe Street, Tallahassee, Florida 32303. The portion of the building under renovation will be the 2/3rds of the previous 'Food Lion Grocery Store'. The designated area will include but not be limited to column lines 6-EX4 Northeast and R-EXC Northwest. The structure will be steel, clad with EIF stucco system and storefront glass. The general contractor will be responsible for providing a phasing plan/schedule to the owner for approval.

E. Phase IB: This phase consists of the renovation of +/- 3,000 square feet of existing library into a community center. The existing building is located in the Huntington Oaks Shopping Center, North Monroe Street, Tallahassee, Florida 32303. The portion of the building under renovation will be ½ the existing Leon County Public Library. The designated area will include but not be limited to column lines 0-6 Northeast and J-A Northwest. The structure will be steel, clad with EIF stucco system and storefront glass. The existing library must remain open during the duration of phase IA construction. The general contractor will be responsible for providing a phasing plan/schedule to the owner for approval.

F. Phase II: This phase consists of the front façade renovation of portions of the Huntington Oaks Shopping Center, North Monroe Street, Tallahassee, Florida 32303. The designated area will include but not be limited to column lines EXSC1-EXSC11 & EX4 – EXSC33. The structure will be clad with EIF stucco system and some storefront glass. The existing tenants will require access to their units during regular business operation. The general contractor will be responsible for providing a phasing plan/schedule to the owner for approval.

G. **The general contractor shall provide a price for each phase of construction.**

1.02 CONTRACT DESCRIPTION

A. Contract Type: A delivery method wherein the Owner selects a General Contractor to develop a low bid price from construction documents from which the Owner selects lump sum bids.

Selection is based on the lowest possible bid and the General Contractor serves as a single point of responsibility for construction.

B. The work of each separate prime contract is identified in this section and on the Drawings.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. **Add Alternate One:** Shopping Center Columns (approximately 14 Columns): Provide stone veneer at all column bases. Stone (as specified in the technical specifications) will be similar to the Library and Community Center stone walls located between column lines 4-7. The height will be the same as shown for the EIFS wall base on the Shopping Center Elevations. The stone will be terminated with a typical 4.5"x3.25" (similar detailing as shown on architectural sheet A1.0) cast stone cap with mitered edge. Provide cost deduct for all EIFS wall base at each column base in add alternate one pricing.

1.04 WORK BY OWNER

A. Items noted NIC (**Not in Contract**) will be supplied and installed by Owner before Substantial Completion. Some items include:
   1. Movable Cabinets/Bookshelves.
   2. Furnishings/Chairs/Tables.
   3. Small Equipment.
   4. Checkout Desk.
   5. Refrigerators
   6. Ice Makers

1.05 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas that will be addressed in the Preconstruction Meeting, in accordance to the limited defined by the demolition plan in the construction documents as *"Limits of Construction"*. Staging areas will be allowed in accordance to the limited defined by the demolition plan in the construction documents as *"6' Chainlink Fence"*.

B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.

C. Emergency Building Exits during Construction: Keep all exits required by code open during

construction period.

D. Time Restrictions:
   1. Coordinate construction schedule and operations with Owner, The Leon County Library Director or Owners Representative at Preconstruction Meeting.

1.07 WORK SEQUENCE

A. Coordinate construction schedule, construction phasing and operations with Owner or Owners Representative at Preconstruction Meeting

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTIONS – NOT USED

END OF SECTION

SECTION 01040 – COORDINATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Coordination Drawings.
4. Administrative and Supervisory Personnel.
5. Cleaning and Protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Project Meetings" for progress meetings, coordination meetings, and pre-installation conferences.
2. Division 1 Section "Materials and Equipment" for coordinating general installation.
3. Division 1 Section "Contract Closeout" for coordinating contract closeout.

1.03 COORDINATION

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.

1.04 SUBMITTALS

A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components. The General Contractor shall review, stamp and sign all shop drawings and submittals before issuing them to the Architect. If the follow review has the not occurred, the Architect has the right to reject any submittal.

1. Show the relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals."

B. Staff Names: Within 15 days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.

1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.02 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.

4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for cutting and patching.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating cutting and patching with other construction activities.
2. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

    a. Requirements of this section apply to all structural, mechanical and electrical installations. Refer to Structural, Mechanical, Electrical and Plumbing Engineering construction documents and their technical specifications sections for other requirements and limitations applicable to cutting and patching structural, mechanical and electrical installations.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures well in advance of the time cutting and patching will be performed. Request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform Work.
4. Indicate dates when cutting and patching will be performed.
5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

    a. Foundation construction.

b. Bearing and retaining walls.
c. Structural concrete.
d. Structural steel.
e. Lintels.
f. Piping, ductwork, vessels, and equipment.

B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:

a. Primary operational systems and equipment.
b. Air or smoke barriers.
c. Water, moisture, or vapor barriers.
d. Membranes and flashings.
e. Fire protection systems.
f. Noise and vibration control elements and systems.
g. Control systems.
h. Communication systems.
i. Conveying systems.
j. Electrical wiring systems.
k. Operating systems of special construction in Division 13 Sections.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. 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.
3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.

4. Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.4 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01050 – FIELD ENGINEERING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

General: This Section specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:

Civil and surveying engineering services, by State of Florida registered professional engineers.

Survey: Submit a Certified Survey of the completed facility including topography and utilities with all measured directions, directions, and depth elevations.

Document Presentation Format: Archive material in digital form on CD ROM or DVD. Provide copies in "Adobe Acrobat" (.pdf) format.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.01 EXAMINATION

Identify existing control points and property line corner stakes.

Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.

Promptly replace lost or destroyed project control points. Base replacement on the original survey control points.

Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.

Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

3.02 PERFORMANCE

Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project.

Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

Advise entities engaged in construction activities of marked lines and levels provided for their use.

As construction proceeds, check every major element for line, level and plumb and for depth elevation as required.

Site Improvements: Coordinate, locate and layout site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

Building Lines and Levels: Coordinate, locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical work.

Electrical Equipment: Coordinate, locate and lay out pad mounted switching equipment and transformers for work to be performed by local power company, locating all service underground and elevate all underground site work prior to cover over work with back fill.

Plumbing: Coordinate, locate and lay out all plumbing, water, sanitary and storm sewer lines and all clean outs and related work. Take elevation readings on all site work lines, etc., prior to covering with back fill.

END OF SECTION

SECTION 01095 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic contract definitions are included in the Conditions of the Contract.

B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.

D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "installer," means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of authorities having jurisdiction.

2. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements

over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

J. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on CSI's 16-Division format and MasterFormat's numbering system.

B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

a. The words "shall be" are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with 2 or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer to the Architect before proceeding for a decision on requirements that are different but apparently equal, and where it is uncertain which requirement are the most stringent.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as

appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research Co.'s "Encyclopedia of Associations," available in most libraries.

F. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in the Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

1.5 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

1.6 CODES AND STANDARDS

A. Applicable Codes: All construction shall be in compliance with the codes and standards listed on the drawings unless changed by local or state ordinances.

END OF SECTION

SECTION 01200 – PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED SECTIONS

A. Section 01270 – Unit Prices: Monetary values of unit prices, payment and modification procedures relating to unit prices.

1.03 SCHEDULE OF VALUES

A. Submit a printed schedule on AIA Form G703 – Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

B. Submit Schedule of Values in duplicate within 15 days after date of Owner–Contractor Agreement.

C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization.

D. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

E. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Present required information in typewritten form.

C. Form: AIA G702 Application and Certificate for Payment and AIA G703 – Continuation Sheet including continuation sheets when required.

D. For each item, provide a column for listing each of the following:
   1. Description of work.
   2. Scheduled Values.
   3. Previous Applications.
   4. Work in Place and Stored Materials under this Application.
   5. Authorized Change Orders.
   6. Total Completed and Stored to Date of Application.
   7. Percentage of Completion.
   8. Balance to Finish.
   9. Retainage.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.

H. Submit three copies of each Application for Payment.

I. Include the following with the application:
   1. Transmittal letter as specified for Submittals in Section 01300.
   2. Construction progress schedule, revised and current as specified in Section 01300.
   3. Current construction photographs specified in Section 01300.
   4. Partial release of liens from major Subcontractors and vendors.
   5. Waivers.
   6. Project record documents as specified in Section 01780, for review by Owner which will be returned to the Contractor.
   7. Affidavits attesting to off-site stored products.

J. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.

C. Construction Change Directive: Architect may issue a document, signed by Owner, instructing Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change in Work.

D. Proposal Request: Architect may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 5 days.

E. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01600.

F. Computation of Change in Contract Amount:
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.
   4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.

G. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.

b. Dates and times work was performed, and by whom.
c. Time records and wage rates paid.
d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract on AIA G701.

I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

K. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 01700.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Preconstruction conferences.
2. Progress meetings/Owners meetings
3. Coordination meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating project meetings with other construction activities.
2. Division 1 Section "Submittals" for submitting the Contractor's Construction Schedule.

1.3 PRECONSTRUCTION CONFERENCE

A. Schedule a preconstruction conference before starting construction, at a time convenient to the Owner and the Architect, but no later than 15 days after execution of the Agreement. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product Data, and Samples.
8. Preparation of record documents.
9. Use of the premises, Limits of Construction
10. Parking availability.
11. Office, work, and storage areas.
12. Equipment deliveries and priorities.
13. Safety procedures.
14. First aid.
15. Security.
16. Housekeeping.
17. Working hours.

1.4 PROGRESS MEETINGS/OWNERS MEETINGS

A. Conduct progress meetings at the Project Site at regular intervals (monthly). Notify the Owner and

the Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and the Architect, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
2. Review the present and future needs of each entity present, including the following:

    a. Interface requirements.
    b. Time.
    c. Sequences.
    d. Status of submittals.
    e. Deliveries.
    f. Off-site fabrication problems.
    g. Access.
    h. Site utilization.
    i. Temporary facilities and services.
    j. Hours of work.
    k. Hazards and risks.
    l. Housekeeping.
    m. Quality and work standards.
    n. Change Orders.
    o. Documentation of information for payment requests.

D. Reporting: Contractor shall no later than 3 days after each meeting, distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

END OF SECTION

SECTION 01270 – UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids. See Bid Form.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.02 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Assist by providing necessary equipment, workers and survey personnel as required.

C. Measurement by Weight: concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

D. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

E. Measurement by Area: Measured by square dimension using mean length and width

or radius.

F. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

G. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

H. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Johnson/Peterson Architects prior to starting work.

I. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

1.05 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work which is incorporated in or made necessary by the Work and accepted by the Johnson/Peterson Architects, multiplied by the unit sum/price.

1.06 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of Johnson/Peterson Architects, it is not practical to remove and replace the Work, Johnson/Peterson Architects will direct one of the following remedies:
   1. The defective Work may remain, but the unit sum/price will be adjusted to a new sum/price at the discretion of Johnson/Peterson Architects.
   2. The defective Work will be partially repaired to the instructions of Johnson/Peterson Architects, ant the unit sum/price will be adjusted to a new sum/price at the discretion of Johnson/Peterson Architects.

C. If, in the opinion of Leon County, it is not practical to remove and replace the Work, Leon county will direct one of the following remedies:
   1. The defective Work may remain, but the unit sum/price will be adjusted to a new Sum/price at the discretion of Leon County.
   2. The defective Work will be partially repaired to the instructions of the Leon

County, and the unit sum/price will be adjusted to a new sum/price at the discretion of Leon County.

D. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.

E. The authority of Johnson/Peterson Architects to assess the defect and identify payment adjustment is final.

1.07 SCHEDULE OF UNIT PRICES

A. See Bid Form.

END OF SECTION

SECTION 01300 – ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Progress meetings.

C. Construction progress schedule.

D. Progress photographs.

E. Submittals for review, information, and project closeout.

F. Number of copies of submittals.

G. Submittal procedures.

1.02 RELATED SECTIONS

A. Section 01100 – Summary: Stages of the Work, Work covered by each contract and occupancy.

B. Section 01700 – Execution Requirements: Additional coordination requirements.

C. Section 01780 – Closeout Submittals: Project record documents.

1.03 PROJECT COORDINATION

A. Project Coordinator: General Contractor as selected by the Leon County Board of County Commissioners and/or the superintended selected by the General Contractor.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

C. Attendance Required:
   1. Owners Representative for the Leon County Board of County Commissioners.
   2. Architect of Record
   3. Architects Project Manager
   4. General Contractor
   5. General Contractors Superintendent
   6. Major Subcontractors

D. Agenda:
   1. Use of premises by Owner and Contractor.
   2. Owner's requirements and occupancy prior to completion.
   3. Construction facilities and controls provided by Contractor.
   4. Temporary utilities provided by General Contractor.
   5. Security and housekeeping procedures.
   6. Schedules.
   7. Application for payment procedures.
   8. Procedures for testing.
   9. Procedures for maintaining record documents.
   10. Requirements for start-up of equipment.

E. The General Contractor is required to record minutes and distribute copies within two (2) days after meeting with participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. Contractor shall schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and Suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

E. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.

4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

F. The General Contractor is required to record minutes and distribute copies within three days after meeting to participants, with one copy to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.04 PROGRESS PHOTOGRAPHS

A. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect. Photograph shall be incorporated into the close out documents.

B. Provide a one stationary video camera on site to video construction throughout progress of Work. The camera should be positioned so that the entire building can be identified. Provide an independent web site or company web site to stream live video during the construction process. Questions: Consult with Leon County's Network Construction Planner for M.I.S.

C. Take photographs on date for each application for a payment and as follows:
   1. Site clearing.
   2. Excavations.
   3. Foundations.

4. Structural framing.
5. Enclosure of building.
6. Final completion.

E. Prints: Color Prints.
1. Digital prints emailed to the Architect.
2. Size: 5.0 Mega pixel or better.
3. Identify each print. Identify name of Project, phase and date.

F. Email print at every Application for Payment. dshuler@jparchitects.com

3.05 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

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

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01780 - CLOSEOUT SUBMITTALS.

3.06 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:

1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review:
   1. Small Size Sheets, Not Larger than 8-1/2 x 11 inches: Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Architect.
   2. Larger Sheets, Not Larger than 24 x 36 inches: Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Architect.

B. Documents for Information: Submit a minimum of three (3) copies.

C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.

D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.09 SUBMITTAL PROCEDURES

A. Transmit each submittal with AIA Form G810 transmittal letter or company's transmittal letter.

B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

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

E. Deliver submittals to Architect at business address. 930 Thomasville Road, Suite 100, Tallahassee Florida 32303

H. Schedule submittals to expedite the Project, and coordinate submission of related items.

I. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.

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

K. Provide space for Contractor and Architect review stamps.

L. When revised for resubmission, identify all changes made since previous submission.

M. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

N. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for quality-control services.

B. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements. A/E required or specified testing shall be by labs acceptable to A/E.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

E. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.

1.03 RESPONSIBILITIES

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services shall be included in the Contract Sum. A/E required or specified testing shall be by labs acceptable to A/E.

1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.

B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document

requirements, regardless of whether the original test was Contractor's responsibility.

1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.

C. Associated Services: 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, the following:

1. Provide access to the Work.
2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
4. Provide facilities for storage and curing of test samples.
5. Deliver samples to testing laboratories.
6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
7. Provide security and protection of samples and test equipment at the Project Site.

D. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
3. The agency shall not perform any duties of the Contractor.

1.04 SUBMITTALS

A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:

   a. Date of issue.
   b. Project title and number.
   c. Name, address, and telephone number of testing agency.
   d. Dates and locations of samples and tests or inspections.
   e. Names of individuals making the inspection or test.
   f. Designation of the Work and test method.
   g. Identification of product and Specification Section.
   h. Complete inspection or test data.
   i. Test results and an interpretation of test results.
   j. Ambient conditions at the time of sample taking and testing.
   k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
   l. Name and signature of laboratory inspector.
   m. Recommendations on retesting.

1.05 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION

SECTION 01500 – TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Temporary Electricity
2. Temporary Telephone
3. Temporary Facsimile
4. Temporary Water
5. Temporary Sanitary Facilities
6. Barriers and Enclosures
7. Fences
8. Surface Water Control
9. Progress Cleaning and Waste Removal
10. Field Offices and Sheds
11. Removal of Construction Facilities and Temporary Controls

B. Related Documents: The Contract Documents, as defined in Section 01000 – Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

1.02 TEMPORARY ELECTRICITY

A. Electricity is not available at the site. General Contractor shall provide all means of distribution for his use at the construction site.

1.03 TEMPORARY TELEPHONE

A. General Contractor shall provide, maintain and pay for telephone service to field office (if provided) at time of project mobilization. With or without a field office being provided, provide at least mobile telephone means of communication at the job site at all times work is underway.

1.04 TEMPORARY FACSIMILE AND INTERNET SERVICES

A. General Contractor shall provide, maintain and pay for facsimile and internet services to field office at time of project mobilization.

1.05 TEMPORARY WATER

A. Water is not available at the site. General Contractor shall provide all means of distribution for his use at the construction site.

1.06 TEMPORARY SANITARY FACILITIES

A. General Contractor shall provide and maintain required facilities and enclosures.

1.07 BARRIERS AND ENCLOSURES

A. Provide barriers to prevent unauthorized entry to construction areas and to protect adjacent properties from damage from construction operations and demolition in accordance with OSHA and governing authorities having jurisdiction. See the limits of construction and the 6' chain link fence limitations on the construction documents.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.

C. Provide protection for plant life designated to remain. Replace damaged plant life with new.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.08 FENCES

A. Contractor is to erect a 6' high temporary chain link fence along the limits of construction, so as to deter pedestrian from wandering into area of Construction. The gate must be locked when no construction activities are going on. Signs must be posted on fence "Under Construction".

1.09 SURFACE WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.12 PROGRESS CLEANING AND WASTE REMOVAL

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

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site according to local and state legal requirements.

1.13 FIELD OFFICES AND SHEDS

A. General Contractor shall provide a temporary office. Contractor shall coordinate with the Owner and the Architect for the location of a temporary office. The preferred location of the owner will be the backside of the building.

1.141 REMOVAL OF CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

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

B. Remove underground installations.

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

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

PART 2 PRODUCTS – NOT USED

PART 3 PRODUCTS – NOT USED

END OF SECTION

SECTION 01585 – PROJECT SIGNS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

B. Project informational signs.

1.02 RELATED SECTIONS – NONE

1.03 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr wind velocity.

B. Sign Designer: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.04 SUBMITTALS

A. See Section 01300 – Administrative Requirements for submittal procedures.

B. Shop Drawing: Show content, layout, lettering, font, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate.

B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.

C. Rough Hardware: Galvanized.

D. Paint and Primers: Exterior quality, two coats.

E. Lettering: Exterior quality paint or vinyl in contrasting colors.

2.02 PROJECT IDENTIFICATION SIGN

A. One painted sign of construction, design, and content shown on Drawings, location designated.

B. One painted sign, 32 sq ft area, and bottom 6 feet above ground. Sign maybe mounted to the

temporary construction fence.

C. Content:
   1. Leon County project name: LeRoy Collins, Leon County Public Library System – Lake Jackson Branch Library, Community Center & Huntington Oaks Shopping center Renovations.
   2. Provide Leon County project number & logo.
   3. Names of the current Leon County Board of County Commissioners
   4. Name of Leon County Administrator.
   5. Name of Leon County Library Director
   6. Business name and logo of Architect, Structural Engineer, MEP Engineer.
   7. Business name and logo of General Contractor.
   8. Architectural Rendering of the Library, provided by the Johnson Peterson Architect.

D. Graphic Design, Colors, Style of Lettering: Designated by Architect. Provide shop drawing for project sign.

E. Lettering: Series C of Standard Alphabet for Highway Signs, Public Roads Administration, Federal Works Agency.

PART 3 EXECUTION

3.01 INSTALLATION

A. General Contractor shall install project identification sign within 10 days after date fixed by Notice to Proceed.

B. Erect at Owners designated location.

C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

D. Install sign surface plumb and level, with butt joints. Anchor securely.

E. Paint exposed surfaces of sign, supports, and framing.

3.02 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 01600 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
2. Division 1 Section "Administrative Requirements" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
3. Division 1 Section "Substitutions" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature that is current as of the date of the Contract Documents.

2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

A. Product List: Prepare a list showing products specified in tabular form acceptable to the Architect. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.

1. Coordinate product list with the Contractor's Construction Schedule and the Schedule of Submittals.
2. Form: Prepare product list with information on each item tabulated under the following column headings:

   a. Related Specification Section number.

b. Generic name used in Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.

3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of an initial product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.

   a. At the Contractor's option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.

4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.
5. Architect's Action: The Architect will respond in writing to Contractor within 1 week of receipt of the completed product list. No response within this period constitutes no objection to listed manufacturers or products but does not constitute a waiver of the requirement that products comply with Contract Documents. The Architect's response will include a list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.5 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

   1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:

   1. No available domestic product complies with the Contract Documents.
   2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturers or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

   1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
   2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

      a. Name of product and manufacturer.

b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. Semiproprietary Specification Requirements: Where Specifications name 3 or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.

   a. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

2. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
3. Descriptive Specification Requirements: Where Specifications describe a product or assembly,

listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.

    a. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.

5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

    a. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.

7. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

    1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

SECTION 01631 - SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
2. Division 1 Section "Administrative Requirements" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.

1.3 DEFINITIONS

A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:

1. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
2. Revisions to the Contract Documents requested by the Owner or Architect.
3. Specified options of products and construction methods included in the Contract Documents.
4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

A. Substitution Request Submittal: The Architect will consider requests for substitution if received within 30 days after commencement of the Work. Requests received more than 30 days after commencement of the Work may be considered or rejected at the discretion of the Architect.

1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and according to procedures required for change-order proposals.
2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

    a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors, that will be necessary to accommodate the proposed substitution.
    b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
    c. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
    d. Samples, where applicable or requested.

e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
f. Cost information, including a proposal of the net change, if any in the Contract Sum.
g. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

4. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution within 2 weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order.

   a. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute within the time allocated.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Conditions: The Architect will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements.

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents.
3. The request is timely, fully documented, and properly submitted.
4. The specified product or method of construction cannot be provided within the Contract Time. The Architect will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
5. The request is directly related to an "or-equal" clause or similar language in the Contract Documents.
6. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.
7. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

B. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01700 – EXECUTION REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Cleaning and Protection.

B. Closeout procedures, except payment procedures.

C. Cutting and Patching

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.01 EXAMINATION

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

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

E. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Prepare surfaces and remove surface finishes to provide for proper installation of new work and finishes.

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

C. Seal cracks or openings of substrate prior to applying next material or substance.

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

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install Products as specified in individual sections.

3.04 CUTTING AND PATCHING

A. Execute cutting and patching including excavation and fill to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for

penetration of mechanical and electrical work, to execute patching to compliment adjacent work, and to fit Products together to integrate with other work.

B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

D. Cut rigid materials using masonry saw or core drill. Pnuematic tools not allowed without prior Approval.

E. Restore work with new Products in accordance with requirements of Contract Documents.

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

G. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with fire rated material in accordance with Section 07840, to full thickness of the penetrated element.

H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.05 PROGRESS CLEANING

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

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris and rubbish from site periodically and dispose offsite.

3.06 PROTECTION OF INSTALLED WORK

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

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

3.07 FINAL CLEANING

A. Clean surfaces exposed to view; remove temporary labels, stains and foreign substances.

B. Clean debris from roofs, gutters, downspouts and drainage systems.

C. Clean site; sweep paved area, rake clean landscaped surfaces.

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

3.08 CLOSEOUT PROCEDURES

A. See Section 01780 – Contract Closeout for closeout procedures.

B. Make submittals that are required by governing or other authorities.

C. Notify Johnson Peterson Architects when work is considered ready for Substantial Completion.

D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Johnson/Peterson Architects' review.

E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for Leon County Facilities Management.

F. Notify Johnson Peterson Architects when work is considered finally complete.

G. Complete items of work determined by Johnson Peterson Architects final inspection.

END OF SECTION

SECTION 01740 - WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Contract Closeout" specifies contract closeout procedures.
2. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.
3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS

A. Standard products warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner

can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

1. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. 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-inch (115-by-280-mm) 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.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

END OF SECTION

SECTION 01780 – CONTRACT CLOSEOUT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Project record document submittal.
3. Operation and maintenance manual submittal.
4. Submittal of warranties.
5. Final Cleaning

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.03 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.

    a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
    b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Advise the Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Submit record drawings, maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra stock, and similar items.
7. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
8. Complete final cleanup requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred, exposed finishes.
10. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.04 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
5. Submit consent of surety to final payment.
6. Submit a final liquidated damages settlement statement.
7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Re-inspection Procedure: The Architect will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of re-inspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, re-inspection will be repeated.

1.05 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
3. Note related change-order numbers where applicable.
4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change

Orders and modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
3. Note related record drawing information and Product Data.
4. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

D. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
3. Upon completion of markup, submit complete set of record Product Data to the Architect for the Owner's records.

E. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the Architect and the Owner's personnel at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's Sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner's records.

G. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn-around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.
8. Fixture lamping schedule.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and

maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Hazards.
4. Cleaning.
5. Warranties and bonds.
6. Maintenance agreements and similar continuing commitments.

3.02 FINAL CLEANING

A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1 Section "Temporary Facilities and Controls."

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.

   a. Remove labels that are not permanent labels.
   b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
   c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
   d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
   e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.

END OF SECTION

SECTION 02361 SOIL TREATMENT FOR TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

1.02 REFERENCES

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Latest edition).
B. Section 01811

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Test Reports: Indicate regulatory agency approval reports when required.

D. Manufacturer's Application Instructions: Indicate caution requirements.

E. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.

F. Record moisture content of soil before application.

G. Maintenance Data: Indicate re-treatment schedule.

H. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work and:
   1. Having minimum of 2 years documented experience.
   2. Approved by manufacturer of treatment materials.
   3. Licensed in the State in which the Project is located.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for requirements for application, and comply with EPA regulations.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of

toxicants.

1.06 SEQUENCING

A. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade.

1.07 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide five year installer's warranty against damage to building caused by termites.
   1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.
   2. Inspect annually and report in writing to Owner. Provide inspection service for three (3) years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers:
   1. Agrotec, Inc.
   2. Bayer Corp.
   3. Chas. H Lilly Co.

B. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.

C. Diluent: Recommended by toxicant manufacturer.

2.02 MIXES

A. Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION

A. Spray apply toxicant in accordance with manufacturer's instructions.

B. Apply toxicant at following locations:
   1. Under slabs-on-grade.
   2. At both sides of foundation surface.
   3. Soil within 10 feet of building perimeter for a depth of 2 feet.

C. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

D. Re-treat disturbed treated soil with same toxicant as original treatment.

E. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION OF FINISHED WORK

A. Do not permit soil grading over treated work.

END OF SECTION

SECTION 02520 PRECAST CONCRETE WARNING TACTILE MATT, THIN SET SPECIFICATION

PART 1: GENERAL

1.01 SUMMARY

A. Perform all work required to complete, as indicated by the Contract Documents and furnish all supplementary items necessary for the proper installation of Precast Concrete Pavers.

1.02 RELATED SECTIONS

A. 03320 – Concrete shall not exceed 1/8" in 10'-0" from required plane. Concrete to be steel troweled with fine broom finish. No curing or sealing compound used.

1.03 SYSTEM DESCRIPTION SUMMARY

A. System shall consist of precast concrete pavers installed on Latex thinset mortar setting bed.

B. The paver installation shall be absolutely rigid and even large slabs when subjected to vehicular traffic, shall not be displaced.

1.04 REFERENCES

A. Refer to Section 01090 – References Standards

B. American Society for Testing and Materials (ASTM)
1. ASTM C 33: Specification for Concrete Aggregates
2. ASTM C 150: Specification for Portland Cement
3. ASTM C 67: Method of Sampling and Testing Brick and Structural Clay Tile
4. ASTM C 140: Specification for concrete

C. T.C.A. Tile Council of America
1. Installation Method Cement Mortar Bonded F102.

D. A.N.S.I. American National Standards Institute
1. A-118.4 Latex Portland Cement Mortar
2. A-118.6 Grout – Latex

1.05 SUBMITTALS

A. Submit the following in accordance with the Supplementary General Conditions:
1. Manufacturer's Literature: Materials descriptive literature, installation instructions and paver color selection chart.
2. Test Reports: Three (3) copies, showing compliance with specified ASTM requirements.
3. Shop drawings:
   a. Layout drawings of each paved area showing the pattern of pavers, indicate pavers requiring cutting, indicate setting bed methods in each area, drainage patterns and drains. Include details of setting beds, noting all materials and their thickness, show details at curbs and vertical surfaces.
4. Samples: Three (3) sample pavers of each manufactured, type, size and color selected or specified.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. All products covered under this Section shall be produced by a single manufacturer unless otherwise specified.
2. Manufacturer shall submit evidence of having not less than fifteen (15) years successful production of this product.

3. The paver manufacturer shall demonstrate, either by proven field performance or a laboratory freeze-thaw test, that the paving units have adequate durability if they are to be subjected to a freeze-thaw environment.
   a. Satisfactory field performance is indicated when units similar in composition and made with the same manufacturing process as those to be supplied to the purchaser, do not exhibit objectionable deterioration after at least 3 years.
   b. The units used as the basis for proven field performance shall have been exposed to the same general type of environment, temperature range and traffic volume as is contemplated for the units supplied to the purchaser.

B. Subcontractor Qualifications:
   1. Subcontractor shall submit evidence of skill and not less than five (5) years specialized experience with this product.

C. Pre-Installation Conference: As directed by the Architect.

1.07 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Do no work during freezing weather or on wet or frozen sub-base.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate sequencing and scheduling of work with other supporting, adjacent, contiguous or otherwise related material trades.

PART 2: PRODUCTS

2.02 MATERIALS

A. Basis of Design: System Source: Wausau Tile, Wausau WI, 1-800-388-8728; 715-359-3121 Fax: 715-359-7456 www.wausautile.com
   paving@wausautile.com

B. System Name: Thinset Mortar Method - Pedestrian Installation

C. Precast Concrete Pavers
   1. Name: Terra-Pavers ADA Tactile Warning Pattern
   2. Size: 23 3/16" X 23 3/16"
   3. Finish and Color: ADA-60 (QS).
   4. Reference Standard:
      a. Cementitious Materials: Materials shall conform to the following applicable ASTM Specifications
         1.) Portland Cement: ASTM C 150 for Portland Cement
      b. Aggregates shall conform to these ASTM specifications, except that grading requirements shall not necessarily apply:
         1.) Normal Weight: ASTM C 33 for Concrete Aggregates
      c. Other Constituents: Coloring pigments, integral water repellents, etc., shall be previously established as suitable for use in concrete and either shall conform to ASTM Standards where applicable, or shall be shown by test or experience not to be detrimental to the durability of the concrete.
   5. Performance Requirements:
      a. Compressive Strength: At the time of delivery to the work site, the average compressive strength shall not be less than 8,000 psi with no individual unit less than 8,000 psi per ASTM C 140.
      b. Absorption: The average shall not be greater than 6% per ASTM C140.

c. Flexural Strength: Not less than 800 psi per ASTM 293 .
d. Load carrying capacity: Paver units shall have a tested center load capacity of 1,850 lbs. WT CL96
e. Latex Mortar Mix: A.N.S.I A-118.4
f Water: Clean and free of deleterious acids, alkalies or organic materials
g. Grout: A.N.S.I. A-118.6, Grout - Latex
h. Sealant: As specified in Section 07920 - Sealants and Caulking
i. Back-up: As specified in Section 07920 - Sealants and Caulking
j. Bond Breaker: As specified in Section 07920 - Sealants and Caulking

2.03 MIXING

A. Latex Portland Cement Mortar setting bed: As recommended by the manufacturer.

B. Grouting Mix: Latex as recommended by manufacturer. Color as selected.

C. Rework mixes from time to time to maintain proper consistency, as recommended by manufacturer but do not add ingredients. Discard mortar that has reached its initial set.

PART 3: EXECUTION

3.01 INSPECTION

A. Examine all surfaces to receive the parts of the work specified herein. Concrete slab shall not exceed 1/8" in 10'-0" from required plane. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected. Installation of precast concrete pavers and associated construction constitutes acceptance of the adjacent and underlying construction.

B. Installation of Mortar bed as per TCA F102. All materials used follow instructions of manufacturer for use in mortar method.

C. Install precast concrete pavers

D. Grouting of pavers in strict accordance with grout manufacturer's directions and instructions. Latex or acrylic additives of the same manufacturer as the grout.

E. All control and expansion joints to be installed as per TCA EJ 171. All joint materials used to follow manufacturer's directions and instructions.

F. Field cut precast pavers in accordance with manufacturer's recommendations for methods,equipment and precautions.

3.02 CLEANING AND PROTECTION

A. Remove and replace pavers which are loose, chipped, broken, stained or other wise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.

B. Cleaning: Remove mortar stains and all other types of soiling from exposed paver surfaces, wash and scrub clean.

C. Provide final protection and maintain conditions in a manner acceptable to installer, whichensures paver work being without damage or deterioration at time of substantial completion.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Concrete building frame members.

C. Elevated concrete slabs.

D. Floors and slabs on grade.

E. Concrete foundations.

F. Concrete reinforcement.

G. Joint devices associated with concrete work.

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

I. Concrete curing.

1.02 RELATED SECTIONS

A. Section 02751 – Portland Cement Concrete Paving: Sidewalks, curbs and gutters.

B. Section 07900 – Joint Sealers.

1.03 REFERENCES

A. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 1997).

B. ACI 211.2 – Standard Practice for Selecting Proportions for Structural Lightweight Concrete; American Concrete Institute International; 1998.

C. ACI 301 – Specifications for Structural Concrete for Buildings; American Concrete Institute International; 1996.

D. ACI 302.1R – Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 1996.

E. ACI 304R – Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 1989 (Reapproved 1997).

F. ACI 305R – Hot Weather Concreting; American Concrete Institute International; 1991.

G. ACI 306R – Cold Weather Concreting; American Concrete Institute International; 1988.

H. ACI 308 – Standard Practice for Curing Concrete; American Concrete Institute International; 1992 (Reapproved 1997).

I. ACI 318 – Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 1999.

J. ASTM A 185 – Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement; 1997.

K. ASTM A 497 – Standard Specification for Steel Welded Wire fabric, Deformed, for Concrete Reinforcement; 1997.

L. ASTM A 615/A 615M – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.

M. ASTM A 767/A 767M – Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 1997.

N. ASTM A 775/A 775M – Standard Specification for Epoxy-Coated Reinforcing Steel Bars; 1997.

O. ASTM A 884/A 884M – Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement; 1996a.

P. ASTM C 33 – Standard Specification for Concrete Aggregates; 1999a.

Q. ASTM C 39/C 39M – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 1999.

R. ASTM C 94/C 94M – Standard Specification for Ready-Mixed Concrete; 2000.

S. ASTM C 150 – Standard Specification for Portland Cement; 1999a.

T. ASTM C 171 – Standard Specification for Sheet Materials for Curing Concrete; 1997a.

U. ASTM C 173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 1994a.

V. ASTM C 260 – Standard Specification for Air-Entraining Admixtures for Concrete; 1998.

W. ASTM C 309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 1998a.

X. ASTM C 330 – Standard Specification for Lightweight Aggregates for Structural Concrete; 1999.

Y. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 1999a.

Z. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete; 1999.

AA. ASTM C 685 - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 1998a.

AB. ASTM C 881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 1999.

AC. ASTM C 1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999.

AD. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 1999.

AE. ASTM D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 1998.

AF. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 1999.

AG. ASTM D 3963/D 3963M - Standard Specification for Fabrication and Job-Site Handling of Epoxy Coated Reinforcing Steel Bars; 1999.

AH. ASTM E 1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996.

AI. ASTM E 1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers [Metric]; 1996.

AJ. COE CRD-C 513 - COE Specifications for Rubber Waterstops; Corps of Engineers; 1974.

AK. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; Corps of Engineers; 1974.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products.

C. Samples: Submit two, 6 inch long samples of waterstops and construction joint devices.

D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.

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

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Acquire cement from same source and aggregate from same source for entire project.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

PART 2 PRODUCTS

2.01 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

2.02 REINFORCEMENT

A. Reinforcing Steel: As indicated on drawings.

C. Welded Steel Wire Fabric: ASTM A 185, plain type.
   1. Coiled Rolls.
   2. Mesh Size and Wire Gage: As indicated on drawings.

D. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage (1.5 mm).
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C 33.

C. Lightweight Aggregate: ASTM C 330.

D. Fly Ash: ASTM C 618, Class C or F.

E. Calcined Pozzolan: ASTM C 618, Class N.

F. Silica Fume: ACI 211.1

G. Water: Clean and not detrimental to concrete.

2.04 ADMIXTURES

A. Air Entrainment Admixture: ASTM C 260.

B. Chemical Admixtures: ASTM C 494/C 494M, Type A – Water Reducing, Type C – Accelerating, and Type G – Water Reducing, High Range and Retarding.
   1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.05 CONCRETE ACCESSORIES

A. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.

B. Bonding Agent: ASTM C 1059, Type II acrylic non-redispersable type.

C. Epoxy Bonding System: ASTM C 881, type as required by project conditions.

D. Vapor Retarder: 6 mil (0.5 mm) thick clear polyethylene film, type recommended for below grade application.

E. Non-Shrink Grout: ASTM C 1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,400 psi (17 MPa).
   2. Minimum Compressive Strength at 28 Days: 7,000 psi (48 MPa).

F. Moisture-Retaining Cover: ASTM C 171; regular curing paper, white curing paper, clear polyethylene, white polyethylene, or white burlap-polyethylene sheet.

G. Concrete sealer: use same sealer as indicated in section 03362 – Chemically Stained Concrete.

2.06 JOINT DEVICES AND MATERIALS

A. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751, 1/4 inch (6 mm) thick and 4 inches (200 mm) deep; tongue and groove profile.

B. Construction Joint Devices: Integral galvanized steel; 4 inch high, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.

C. Sealant and Primer: As specified in Section 07900.

2.07 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Proportioning Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.

C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

E. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard (0.89 kg per cubic meter), or as recommended by manufacturer for specific project conditions.

F. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 3000 psi.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
   4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
   5. Water-Cement Ratio: Maximum 40 percent by weight.
   6. Total Air Content: 4 percent, per ASTM C 173.
   7. Maximum Slump: 3 inches (75 mm).
   8. Maximum Aggregate Size: 1 inch.

2.08 MIXING

A. On Project Site: NOT PERMITTED.

B. Transit Mixers: Comply with ASTM C 94/C 94M.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

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

C. Coordinate placement of joint devices with erection of concrete formwork and placement of form

accessories.

D. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

F. Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches (150 mm) and seal watertight by taping edges and ends. Cover with sand to depth shown on drawings.

3.03 INSTALLING REINFORCEMENT

A. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D 3963/D 3963M.

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

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

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

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

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

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

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

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

F. Separate slabs on grade from vertical surfaces with joint filler.

G. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

H. Extend joint filler from bottom of slab to within 1/2 inch (13 mm) of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.

I. Install joint devices in accordance with manufacturer's instructions.

J. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

K. Install joint device anchors for expansion joint assemblies specified in Section 05805. Maintain correct position to allow joint cover to be flush with floor and wall finish.

L. Apply sealants in joint devices in accordance with Section 07900.

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

N. Place concrete continuously between predetermined expansion, control, and construction joints.

O. Do not interrupt successive placement; do not permit cold joints to occur.

P. Place floor slabs in pattern as shown on drawings or saw cut pattern indicated.

Q. Saw cut joints within 24 hours after placing. Use 3/16 inch (5 mm) thick blade, cut into 1/4 depth of slab thickness.

R. Screed floors level, maintaining surface flatness of maximum 1/4 inch in 10 ft (6 mm /3 m).

3.05 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch (6 mm) or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Wood float surfaces that will receive quarry tile, ceramic tile, and terrazzo with full bed setting system.
   2. Steel trowel surfaces that will receive carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
   3. Steel trowel surfaces that will be left exposed.
      a. Chemical Hardener: After slab has cured, apply water-diluted hardener in three coats per manufacturer's instructions, allowing 24 hours between coats.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.06 CURING AND PROTECTION

A. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.

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

D. Surfaces Not in Contact with Forms:
   1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   2. Begin final curing after initial curing but before surface is dry.
      a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01400.

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

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

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

E. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd (76 cu m) or less of each class of concrete placed.

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

G. Perform one slump test for each set of test cylinders taken.

3.08 DEFECTIVE CONCRETE

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

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

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

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

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 RELATED SECTIONS

A. Section 04810 – Unit Masonry Assemblies: Installation of mortar and grout.

B. Section 04811 – Single Wythe Unit Masonry: Installation of mortar and grout.

C. Section 04820 – Reinforced Unit Masonry Assemblies: Installation of mortar and grout.

1.03 REFERENCES

A. ACI 530/ASCE 5/TMS 402 – Building Code Requirements For Masonry Structures; American Concrete Institute International; 1999.

B. ACI 530.1/ASCE 6/TMS 602 – Specification for Masonry Structures; American Concrete Institute International; 1999.

C. ASTM C 5 – Standard Specification for Quicklime for Structural Purposes; 1979 (Reapproved 1997).

D. ASTM C 91 – Standard Specification for Masonry Cement; 1999.

E. ASTM C 94/C 94M – Standard Specification for Ready-Mixed Concrete; 2000.

F. ASTM C 144 – Standard Specification for Aggregate for Masonry Mortar; 1999.

G. ASTM C 150 – Standard Specification for Portland Cement; 1999a.

H. ASTM C 207 – Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (Reapproved 1997).

I. ASTM C 270 – Standard Specification for Mortar for Unit Masonry; 1999b.

J. ASTM C 387 – Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete; 1999.

K. ASTM C 404 – Standard Specification for Aggregates for Masonry Grout; 1997.

L. ASTM C 476 – Standard Specification for Grout for Masonry; 1999.

M. ASTM C 595M – Standard Specification for Blended Hydraulic Cements (Metric); 1997.

N. ASTM C 780 – Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 1996.

O. ASTM C 1019 – Standard Test Method for Sampling and Testing Grout; 1999.

P. ASTM C 1072 – Standard Test Method for Measurement of Masonry Flexural Bond Strength; 1999.

Q. ASTM C 1142 – Standard Specification for Extended Life Mortar for Unit Masonry; 1995.

R. ASTM C 1314 – Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry; 1999.

S. ASTM E 518 – Standard Test Methods for Flexural Bond Strength of Masonry; 2000.

T. IMIAWC (CW) – Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.

U. IMIAWC (HW) – Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.04 SUBMITTALS

A. See Section 01300 – Administrative Requirements, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C 270 is to be used. Also include required environmental conditions and admixture limitations.

C. Samples: Not applicable.

D. Reports: Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C 270 and test and evaluation reports per ASTM C 780.

E. Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C 476 and test and evaluation reports to ASTM C 1019.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Manufacturer's Instructions: Submit packaged dry mortar manufacturer's installation

instructions.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.
   1. Maintain one copy of each document on project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.

B. Cold Weather Requirements: Comply with recommendations of IMIAWC (CW).

C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

D. Hot Weather Requirements: Comply with IMIAWC (HW).

PART 2 PRODUCTS

2.01 MATERIALS

B. Portland Cement: ASTM C 150, Type I - Normal;

D. Packaged Dry Mortar: ASTM C 387, Type N, using gray color cement.

E. Hydrated Lime: ASTM C 207, Type N.

F. Quicklime: ASTM C 5, non-hydraulic type.

G. Mortar Aggregate: ASTM C 144.

H. Grout Aggregate: ASTM C 404.

I. Grout Coarse Aggregate: Maximum 3/8 inch (10 mm) size; ____ percent by volume.

J. Grout Fine Aggregate: 2-1/4 to three times the sum of volumes of cement and lime used.

L. Water: Clean and potable.

M. Accelerating Admixture: Nonchloride type for use in cold weather.

N. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

O. Plasticizer: Provide submittal

P. Retardant: Provide submittal

Q. Bonding Agent: Latex type.

2.02 MORTAR MIXES

A. Ready Mixed Mortar: ASTM C 1142, Type RM.

B. Mortar for Unit Masonry: ASTM C 270, Property Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type N.

2.03 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C 270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

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

E. If water is lost by evaporation, re-temper only within two hours of mixing.

F. Use mortar within two hours after mixing at temperatures of 90 degrees F (32 degrees C), or two-and-one-half hours at temperatures under 40 degrees F (5 degrees C).

2.04 GROUT MIXES

A. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
   1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
   2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

B. Engineered Masonry: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type

in accordance with ASTM C 94/C 94M.

1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.05 GROUT MIXING

A. Mix grout in accordance with ASTM C 94/C 94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C 476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

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

2.06 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01400.

B. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C 780 recommendations for preconstruction testing.

1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.

C. Grout Mixes: Test grout batches in accordance with ASTM C 1019 procedures.

1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

PART 3 EXECUTION

3.01 PREPARATION

A. Apply bonding agent to existing concrete surfaces.

B. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Install mortar and grout to requirements of Section 04810.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.03 GROUTING

A. Use either high-lift or low-lift grouting techniques, at Contractor's option, subject to other limitations of contract documents.

B. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

C. Perform grouting by means of high-lift technique, except in locations that mandate use of low-lift grouting technique.
   1. Do not use high-lift grouting where size of cavities mandates use of fine grout.

D. Low-Lift Grouting:
   1. Limit height of pours to 12 inches.
   2. Limit height of masonry to 16 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field tests, in accordance with provisions of Section 01400.

B. Test and evaluate mortar in accordance with ASTM C 780 procedures.
   1. Test with same frequency as specified for masonry units.

C. Test and evaluate grout in accordance with ASTM C 1019 procedures.
   1. Test with same frequency as specified for masonry units.

D. Prism Tests: Test masonry and mortar panels for compressive strength in accordance with ASTM C 1314, and for flexural bond strength in accordance with ASTM C 1072 or ASTM E 518; perform tests and evaluate results as specified in individual masonry sections.

3.05 SCHEDULES

A. Exterior Cavity Wall: Type S mortar with Type N pointing mortar.

END OF SECTION

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 following:

1. Concrete masonry units.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 4, Section “Reinforced Unit Masonry”
2. Division 7 Section "Sheet Metal Flashing, Trim and Soffit Panels"
3. Division 7 Section "Joint Sealants"
4. Division 10 Section "Wall Louvers"
5. Reinforced concrete masonry and construction and materials shall conform to all requirements of "Specifications for Masonry Structures ACI 530.1-99/ASCE 6 -99" published by the American Concrete Institute, Detroit, Michigan and the references specified therein.

C. Products installed but not furnished under this Section include the following:

1. Wood nailers and blocking built into unit masonry specified in Division 6 Section "Rough Carpentry."
2. Manufactured reglets in masonry joints for metal flashing specified in Division 7 Section "Sheet Metal Flashing, Trim and Soffit Panels."
3. Hollow metal frames in unit masonry openings specified in Division 8 Section "Steel Doors and Frames."

1.3 PERFORMANCE REQUIREMENTS

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

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

A. As indicated on the structural drawings.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured product specified

C. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

D. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.

1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
2. Each material and grade indicated for reinforcing bars.
3. Each type and size of joint reinforcement.
4. Each type and size of anchors, ties, and metal accessories.

E. Material test reports from a qualified independent testing agency, employed and paid by Contractor or manufacturer, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:

1. Mortar complying with property requirements of ASTM C 270.
2. Mortar complying with BIA M1.
3. Grout mixes. Include description of type and proportions of grout ingredients.
4. Masonry units. including prism tests, for interior walls

Results from tests and inspections performed by testing laboratory shall be reported promptly and in writing to Architect and Contractor.

F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

G. Hot and cold weather construction procedures evidencing compliance with requirements for mortar, grout and construction practices specified in referenced unit masonry standard.

1.5 QUALITY ASSURANCE

A. Unit Masonry Standard: Comply with the requirements of ACI 530.1 as indicated herein.

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

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

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

E. Mockup: Prior to installing unit masonry, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Locate mockups on site in the locations indicated or, if not indicated, as directed by Architect or mutually agreed upon by Owner, Architect and Contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

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

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

1.7 PROJECT CONDITIONS

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

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

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

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

D. Cold-Weather Requirements: Comply with ACI 530.1 for cold-weather construction and the following:
1. Do not lay masonry units that are wet or frozen.
2. Remove masonry damaged by freezing conditions.
3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above. Comply with ACI 530.1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Concrete Masonry Units: Contractors option.
2. Portland Cement, Mortar Cement, Masonry Cement, and Lime:
   a. Essroc Materials, Inc.
   b. Glen-Gray Corporation
   c. Lafarge Corporation.
4. Joint Reinforcement, Ties, and Anchors:
   a. AA Wire Products Co.
   b. Dur-O-Wal, Inc.

c. Heckman Building Products, Inc.

2.2 CONCRETE MASONRY UNITS

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

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions, as noted on drawings.
2. Provide square-edged units at corners and openings.

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

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

   A. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength as indicated in the structure drawings.

2. Weight Classification: Normal weight.

3. Provide Type II, non-moisture controlled units at all interior and exterior walls.

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

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

2.3 MORTAR AND GROUT MATERIALS

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

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

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

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

E Aggregate for Grout: ASTM C 404.

F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

G. Water: Potable.

H. Masonry Cement: ASTM C 91

I. Mortar Cement: U.B.C. Standard No. 21-14.

2.5 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated.

B. Wire: As follows:

4. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for wire ties and anchors in exterior walls.
5. Wire Diameter: 0.1875 inch.

2.6 BENT WIRE TIES

A. Individual units prefabricated from bent wire to comply with requirements indicated below:

1. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with closed ends and not less than 4 inches wide.
2. Tie Shape for Solid Masonry Unit Construction and for Hollow Masonry Units with Cells Horizontal: Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material:

1. Neoprene.
2. Urethane.
3. Polyvinyl chloride.

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

1. Styrene-Butadiene Rubber Compound: ASTM D 2000, Designation M2AA-805.
2. Polyvinyl Chloride: ASTM D 2287, General Purpose Grade, Type PVC-65406.

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

2.8 INSULATION

A. Foamed-In-Place Masonry Insulation. See Section 07214 for further information.

2.9 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup (0.14-L) dry measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry measure laundry detergent dissolved in 1 gal. (4 L) of water.

B. Job-Mixed Muriatic Solution: Solution of one part muriatic acid and 10 parts clean water, mixed in a nonmetallic container with acid added to water.

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

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

3. For masonry subject to metallic oxidation stains, use formulation consisting of a liquid blend of organic and inorganic acids and special inhibitors.
4. Available Products: Subject to compliance with requirements, a product that may be used to clean unit masonry surfaces.

2.11 MORTAR AND GROUT MIXES – See Section 04065

2.12 SOURCE QUALITY CONTROL

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

B. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested for strength, absorption, and moisture content per ASTM C 140.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

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

3.2 INSTALLATION, GENERAL

A. Comply with ACI 530.1 and other requirements indicated applicable to each type of installation included in Project

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

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

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Wetting of Brick: Wet brick prior to laying if the initial rate of absorption exceeds 30g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of laying.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch nor plus 1/2 inch.

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

F. Comply with construction tolerances of ACI 530.1

3.4 LAYING MASONRY WALLS

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

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

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

1. Running bond with vertical joint in each course centered on units in courses above and below.
2. As indicated on Drawings.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

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

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

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

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

I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above and as follows:

1. Install compressible filler in joint between top of partition and underside of structure above.

2. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

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

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

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

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

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

a. For minimum widths of grout spaces of 3/4 inch or for minimum grout space of hollow unit cells of 1-1/2 by 2 inches, pour height of 12 inches.
b. For minimum widths of grout spaces of 2 inches , pour height of 60 inches.

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

a. For minimum widths of grout spaces of 1-1/2 inches, pour height of 12 inches.
b. For minimum widths of grout spaces of 2 inches , pour height of 60 inches.
c. For minimum widths of grout spaces of 2-1/2 inches or for minimum grout space of hollow unit cells of 3 by 3 inches, pour height of 12 feet.

N. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

O. Final Cleaning: After mortar is thoroughly set and cured, remove mortar particles with nonmetallic scrapers, and clean exposed masonry as follows:

1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
2. Protect adjacent surfaces from contact with cleaner.
3. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
4. Clean brick by bucket and brush method described in BIA Technical Note No. 20 Revised, using the specified masonry cleaner.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain.

P. Masonry Waste Disposal: Dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches of finished grade.

Q. Expansion and Control Joints: Build in movement joints where indicated, installing accessory items as masonry is constructed.

R. Lintels: Install lintels of types indicated at all openings.
   1. Bearing: Provide not less than 8 inches of bearing at each jamb.

3.5 MORTAR BEDDING AND JOINTING

A. Solid Masonry Units: Install in full bed joints and with head joint completely filled prior to laying each unit; butter ends with sufficient mortar to fill head joints and shove into place; do not slush head joints or furrow bed joints.
   1. At cavity walls, slope beds toward cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against cavity face of brick.

B. Lay hollow masonry units as follows:

   1. Lay hollow concrete masonry units as follows:

      a. With full mortar coverage on horizontal and vertical face shells, and all cross webs of bearing walls and as follows:
      b. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
      c. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
      d. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch joints.

3.6 CAVITIES

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

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

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

   1. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
   2. Space anchors as indicated, but not more than 16 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

3.9 LINTELS

A. Provide masonry lintels where shown and where openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels.

1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcement bars indicated or required to support loads indicated. Cure precast lintels by same method as CMU.

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

3.10 INSTALLATION OF REINFORCED UNIT MASONRY (Refer to Section 04230)

3.11 FIELD QUALITY CONTROL

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

B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. (460 sq. m) of wall area or portion thereof.

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

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

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

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

3.12 REPAIRING, POINTING, AND CLEANING

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

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

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

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

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.13 MASONRY WASTE DISPOSAL

A. Recycling: Undamaged, excess masonry materials are Contractor's property and shall be removed from the Project site for his use.

B. Disposal as Fill Material: Dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in greatest dimension.
2. Mix masonry waste with at least 2 parts specified fill material for each part masonry waste. Fill material is specified in Division 2 Section "Earthwork."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as fill, as described above, and other masonry waste and legally dispose of off Owner's property.

3.14 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

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

C. Install flashing as follows:

1. At composite masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 8 inches and through the inner wythe to within 1/2 inch of the interior face of the wall in exposed masonry. Where interior surface of inner wtythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches, unless otherwise indicated.
2. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At head and sills, extend flashing 4 inches at ends and turn up not less than 2 inches to form a pan.
3. Cut off flashing neat and flush with face of wall after masonry wall construction is completed.

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

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

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

END OF SECTION

SECTION 04210 - REINFORCED CONCRETE BLOCK MASONRY

1.0 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and all provisions of Contract, including General Conditions, Special Provisions and all Technical Specification sections, apply to work of this section.

B. SUMMARY
   1. This Section includes the following:
      a. Concrete masonry unit construction.

1.2 REFERENCED STANDARDS

A. Reinforced concrete masonry and reinforced brick masonry construction and materials shall conform to all requirements of "Specifications for Masonry Structures ACI 530.1-99/ASCE 6 -99" published by the American Concrete Institute, Detroit, Michigan and the references specified therein.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm):
   1. For concrete unit masonry: As follows:
      a. f'm = 1,500 psi for all walls

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract.

B. Product data for each different masonry unit, accessory, and other manufactured product indicated.

C. Shop drawings for reinforcing in accordance with referenced unit masonry standard.

D. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.
   1. Each different cement product required for mortar and grout including name of manufacturer, brand, type, and weight slips at time of delivery.
   2. Each material and grade indicated for reinforcing bars.
   3. Each type and size of joint reinforcement.
   4. Each type and size of anchors, ties, and metal accessories.
   5. Grout and Mortar Mix designs.

E. Material test reports from a qualified independent testing laboratory employed and paid by Contractor indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:
   1. Mortar complying with property requirements of ASTM C 270.
   2. Masonry Units, including prism tests, for interior walls.

F. Cold-weather construction procedures evidencing compliance with requirements for mortar, grout and construction practices specified in referenced unit masonry standard.

G. Hot-weather construction procedures evidencing compliance with requirements for mortar, grout and construction practices specified in referenced unit masonry standard.

H. Results from tests and inspections performed by testing laboratory shall be reported promptly and in writing to Architect and Contractor.

1.5 QUALITY ASSURANCE

A. Unit Masonry Standard: Comply with the requirements of ACI 530.1 as indicated herein.

B. Single-Source Responsibility for Masonry Units: Obtain masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

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

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

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

C. Store cementitious materials off the ground, under cover, and in dry location.

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

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

1.7 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

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

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.

D. Cold-Weather Construction: Comply with ACI 530.1 for cold-weather construction and the following:
   1. Do not lay masonry units that are wet or frozen.
   2. Remove masonry damaged by freezing conditions.

E. Hot-Weather Construction: Comply with ACI 530.1.

2.0 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Comply with ACI 530.1 and other requirements specified in this Section applicable to each material indicated.

2.2 CONCRETE MASONRY UNITS

A. General: Comply with requirements indicated below applicable to each form of concrete masonry unit required.

1. Provide special shapes where indicated and as follows:
   a. For corners, jambs, sash, control joints, headers, bonding, and other special conditions.
   b. Square-edged units.

B. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.
   1. Concrete Masonry Units: Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.
   2. Provide Type II, non-moisture-controlled units for interior walls.

C. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

D. Hollow Load-Bearing Concrete Masonry Units: ASTM C 90, Grade N and as follows:
   1. Unit Compressive Strength: Provide units with specified compressive strength of masonry finish of 1,500 psi as determined by the unit strength method in accordance with of ACI 530.1 indicated below:
   2. Weight Classification: Normal weight.

2.3 MORTAR AND GROUT MATERIALS

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

B. Masonry Cement: ASTM C 91.

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

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

E. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4 inch use aggregate graded with 100 percent passing the No. 16 sieve.
   1. White Mortar Aggregates: Natural white sand or ground white stone.

F. Aggregate for Grout: ASTM C 404.

G. Water: Clean and potable.

2.4 REINFORCING STEEL

A. General: Provide reinforcing steel complying with requirements of ACI 530.1 and this article, formed from the following at contractors option:
   1. Galvanized carbon steel wire, coating class as required by ACI 530.1 for application indicated
   2. Stainless steel wire, Type 304 complying with ASTM A 580, for exterior walls; and galvanized carbon steel wire, coating class as required by ACI 530.1, for interior walls
   3. Stainless steel wire, Type 304 complying with ASTM A 580.

B. Steel Reinforcing Bars: Material and grade as follows:
   1. Billet steel complying with ASTM A 615.
   2. Grade 60 for #5 bars and larger, grade 40 or grade 60 bars for #4 bars and smaller.

C. Deformed Reinforcing Wire: ASTM A 496.

D. Plain Welded Wire Fabric: ASTM A 185.

E. Deformed Welded Wire Fabric: ASTM A 497.

2.5 JOINT REINFORCEMENT

A. General: Provide joint reinforcement complying with requirements of ACI 530.1 and this article, formed from the following:
   1. Galvanized carbon steel wire, coating class as required by ACI 530.1 for application indicated
   2. Stainless steel wire, Type 304 complying with ASTM A 580, for exterior walls; and galvanized carbon steel wire, coating class as required by ACI 530.1, for interior walls

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:
   1. Wire Diameter for Side Rods: 9 gage (0.1483 inch).
   2. Wire Diameter for Cross Rods: 9 gage 0.1483 inch.

C. Manufacturers: Subject to compliance with requirements, provide joint reinforcement by one of the following:
   1. AA Wire Products Co.
   2. Dur-O-Wal, Inc.
   3. Heckman Building Products, Inc.
   4. Hohmann & Barnard, Inc.
   5. Masonry Reinforcing Corp. of America.
   6. National Wire Products Industries.
   7. Southern Construction Products, Inc.

2.6 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of ACI 530.1 and of this article.

2.7 STEEL WIRE

A. Galvanized Carbon Steel Wire: ASTM A 82, coating class as required by ACI 530.1 for application indicated.

B. Stainless Steel Wire: ASTM A 580, Type 304, for wire ties and anchors in exterior walls, at Contractors option.

2.8 SHEET MATERIAL

A. Steel Plates and Bars: ASTM A 36

2.9 BENT WIRE TIES

A. Individual units prefabricated from bent wire to comply with requirements indicated below:

B. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with closed ends and not less than 4 inches wide.

C. Type for Masonry Where Coursing Between Wythes Does Not Align: Adjustable ties composed of two parts, one with pintles, the other with eyes, maximum misalignment 1-1/4 inches.

2.10 RIGID ANCHORS

A. Provide straps of form and length indicated, fabricated from metal strips of following width and thickness.
   1. 1-1/2 inches wide by 1/4 inch thick.

2.11 MISCELLANEOUS ANCHORS

A. Unit Type Masonry Inserts in Concrete: Cast iron or malleable iron inserts of type and size indicated.

B. Dovetail Slots: Furnish dovetail slots, with filler strips, of slot size indicated, fabricated from 22 gage (0.0336 inch thick) sheet meta

C. Anchor Bolts: Steel bolts complying with F1554, Grade 36; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
   1. Headed bolts.
   2. Nonheaded bolts, straight.
   3. Nonheaded bolts, bent in manner indicated.

2.12 MASONRY CLEANERS

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

B. Job-Mixed Muriatic Solution: Solution of one part muriatic acid and 10 parts clean water, mixed in a nonmetallic container with acid added to water.

C. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned:.
   1. For masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface-acting acids, chelating, and wetting agents.
   2. For dark colored masonry not subject to metallic oxidation stains, use formulation consisting of a liquid blend of surface-acting acids and special inhibitors.
   3. For masonry subject to metallic oxidation stains, use formulation consisting of a liquid blend of organic and inorganic acids and special inhibitors.
   4. Available Products: Subject to compliance with requirements, a product that may be used to clean unit masonry surfaces includes, but is not limited to, the following:
      a. "Sure Klean No. 600 Detergent," ProSoCo, Inc.
      b. "Sure Klean No. 101 Lime Solvent," ProSoCo., Inc.
      c. "Sure Klean Vana Trol," ProSoCo, Inc.

2.13 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring pigments, air entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for Type S Mortar for interior masonry walls.
   1. Limit cementitious materials in mortar to portland cement/lime.

C. Grout for Unit Masonry: Comply with the requirements of ASTM C476 for Coarse Grout for interior masonry.
   1. Limit cementitious materials in grout to portland cement/lime.

2.14 SOURCE QUALITY CONTROL

A. Concrete Masonry Unit Tests: For each type, class, and grade of concrete masonry unit indicated, units will be tested by qualified independent testing laboratory for strength, absorption, and moisture content per ASTM C 140.

3.0 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

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

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

3.2 INSTALLATION, GENERAL

A. Comply with ACI 530.1 and other requirements indicated applicable to each type of installation included in Project.

B. Thickness: Build masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.

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

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

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

3.3 CONSTRUCTION TOLERANCES

A. Comply with construction tolerances of ACI 530.1.

3.4 LAYING MASONRY WALLS

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

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

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less that nominal 4 inch horizontal face dimensions at corners or jambs.
   1. Running bond with vertical joint in each course centered on units in courses above and below.

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

E. Stopping and Resuming Work: In each course, rack back 2 unit length for one-half running bond or 1/3 unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-In Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
   1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
   2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
   3. Fill cores in hollow concrete masonry units with grout three courses (24 inches) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
3. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

3.6 CAVITIES/AIR SPACES

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

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

3.7 HORIZONTAL JOINT REINFORCEMENT

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

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

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

3.8 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
   1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
   2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 LINTELS

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

3.10 INSTALLATION OF REINFORCED UNIT MASONRY

A. General: Install reinforced unit masonry to comply with requirements of ACI 530.1.

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

C. Grouting: Place grout in accordance with the requirements of the ACI 530.1. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

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

3.11 FIELD QUALITY CONTROL

A. Testing Frequency: Tests and evaluations listed in this article will be performed during construction for each 5,000 sq. ft. of wall area or portion thereof.
   1. During constrution, additional prism tests for the wall assembly utilizing the materials used in the field for every 5,000 square feet of wall for field quality control during construction.
   2. Mortar properties will be tested per property specification of ASTM C 270.
   3. Mortar composition and properties will be evaluated per ASTM C 780.

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

3.12 PARGING

A. Parge predampened masonry walls where indicated with Type S or N mortar applied in two uniform coats to a total thickness of 3/4 inch. Scarify first parging coat to ensure full bond to subsequent coat.

B. Use a steel trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp cure parging for at least 24 hours and protect until cured.

3.13 REPAIRING, POINTING, AND CLEANING

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

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

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave 2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
   4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
   5. Clean brick by means of bucket and brush hand-cleaning method described in BIA "Technical Note No. 20 Revised" using the following masonry cleaner:
      a. Job-mixed detergent solution.
      b. Job-mixed acidic solution.
      c. Proprietary acidic cleaner; apply in compliance with directions of acidic cleaner manufacturer.
   6. Clean concrete masonry by means of cleaning method indicated in NCMA TEK 45 applicable to type of stain present on exposed surfaces.

D. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

END OF SECTION

SECTION 04700 - MANUFACTURED MASONRY

PART 1—GENERAL

1.01 SUMMARY

A. Section Includes: Manufactured stone veneer and application materials.

B. Related Sections:

1. Division 07 Section specifying flashing materials.

1.02 REFERENCES

A. American Concrete Institute (ACI).

B. American Society for Testing and Materials (ASTM):
1. ASTM C 39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
2. ASTM C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
3. ASTM C 177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
4. ASTM C 192, Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
5. ASTM C 270, Standard Specification for Mortar for Unit Masonry.
6. ASTM C 482, Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
7. ASTM D 226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
8. ASTM E 2556/ E 2556M Standard Specification for Vapor Permeable Flexible Sheet Water Resistive Barriers Intended for Mechanical Attachment.

C. Building Materials Evaluation Commission.

D. Masonry Standards Joint Committee (MSJC) of The Masonry Society.

E. Underwriters Laboratories (UL):
1. Classification File Number.
2. UL 723, Standard for Safety for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Reference Section Submittal Procedures; submit following items:

1. Product Data: Manufactured masonry and application materials including mortar color charts, and water resistive barrier.

2. Samples: Panel containing full-size samples of specified manufactured masonry showing full range of colors and textures complete with specified mortar.
   a. Actual size of masonry sample approximately 12 by 12 inches (300 by 300 mm).

3. Quality Assurance/Control Submittals:
   a. Qualifications:
      1) Proof of manufacturer qualifications.
      2) Proof of installer qualifications.
   b. Certificates: ICC-ES Report.

c. Test Reports for physical properties.
d. Manufacturer's Installation Instructions.

B. Closeout Submittals: Reference Closeout Submittals; submit following items:

1. Maintenance Instructions.
2. Special Warranties.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications:
   a. Minimum five years experience in producing manufactured masonry.
   b. Member of following organizations:
      1) MSJC.
      2) ACI.
      3) ASTM.

2. Installer Qualifications: Company with documented experience in installation of manufactured masonry including minimum 5 projects within 400 mile radius of this Project.

B. Certifications:

1. Florida Product Approval Number.

C. Field Samples: Provide in a location selected by Architect showing representative sample of installed product including penetration and termination details, corner detail and mortar color and tooling.
   1. Reference Section Quality Control.
   2. Minimum Size: 4 by 4 feet.
   3. Approved field samples may remain as part of completed Work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Reference Section Product Storage and Handling Requirements.

B. Follow manufacturer's instructions.

C. Store moisture-sensitive materials in weather protected enclosures.

1.06 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Maintain materials and ambient temperature in area of installation at minimum 40 degrees F prior to, during, and for 48 hours following installation.

1.07 WARRANTY

A. Special Warranty: Provide manufacturer's standard limited warranty against defects in manufacturing for a period of 50 years following date of Final Acceptance.

1.08 MAINTENANCE

A. Extra Materials: Furnish extra manufactured stone material in a variety of shapes and sizes in quantity equal to three percent of the installed stone.

PART 2—PRODUCTS

2.01 MANUFACTURER

A. Boral Stone Products LLC Tel: (800) 255-1727
One Owens Corning Parkway Fax: (419) 325-3995
Toledo, OH 43659 Website: www.culturedstone.com
INSERT NAME, ADDRESS AND PHONE NUMBERS OF LOCAL DISTRIBUTOR BELOW.
1. Manufacturer's Distributor:

B. Substitutions: Permitted based on this technical specification.

2.02 MANUFACTURED MASONRY MATERIALS

A. Cultured Stone® Textures:

1. Single Texture Color: Gray Cobble Field - CSV 2025.

B. Fasteners:
1. Into Metal Studs: Minimum 7/16 inch (11.1 mm) head diameter, corrosion-resistant , self-drilling, self tapping, pancake head screws of sufficient length to penetrate 3/8 inch (10 mm) minimum into the stud.

C. Weep screed as required for installation over framed construction.

PART 3—EXECUTION

3.01 EXAMINATION

A. Examine substrates upon which manufactured masonry will be installed.

B. Coordinate with responsible entity to correct unsatisfactory conditions.

C. Commencement of work by installer is acceptance of substrate conditions.

3.02 PREPARATION

A. Protection: Prevent work from occurring on the opposite of walls to which manufactured masonry is applied during and for 48 hours following installation of the manufactured masonry.

B. Surface Preparation: Follow manufacturer's instructions designated below for the appropriate type of manufactured masonry and substrate.

3.03 INSTALLATION

A. Install Cultured Stone® products in accordance with manufacturer's Cultured Stone® installation instructions using grouted joints.

3.04 CLEANING

A. Clean manufactured masonry in accordance with manufacturer's installation instructions.

3.06 PROTECTION

A. Protect finished work from rain during and for 48 hours following installation.

B. Protect finished work from damage during remainder of construction period.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, support members, suspension cables, sag rods, and struts.

B. Base plates, shear stud connectors and expansion joint plates.

C. Grouting under base plates.

1.02 RELATED SECTIONS

A. Section 05210 – Steel Joists.

B. Section 05310 – Steel Deck: Support framing for small openings in deck.

C. Section 05500 – Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCES

A. AISC M016 – ASD Manual of Steel Construction; American Institute of Steel Construction, Inc.; 1989, Ninth Edition.

B. AISC S303 – Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 1992.

C. AISC S329 – Allowable Stress Design Specification for Structural Joints Using ASTM A325 or A490 Bolts; American Institute of Steel Construction, Inc.; 1985, Reaffirmed 1994.

D. AISC S345L – Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts; American Institute of Steel Construction, Inc.; 1994.

E. ASTM A 36/A 36M – Standard Specification for Carbon Structural Steel; 1997a.

F. ASTM A 53/A 53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 1999b.

G. ASTM A 108 – Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality; 1999.

H. ASTM A 123/A 123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 1997a.

I. ASTM A 153/A 153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1998.

J. ASTM A 242/A 242M – Standard Specification for High-Strength Low-Alloy Structural Steel; 1998.

K. ASTM A 307 – Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 1997.

L. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 1997.

M. ASTM A 325M – Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 1997.

N. ASTM A 449 – Standard Specification for Quenched and Tempered Steel Bolts and Studs; 1993.

O. ASTM A 490 – Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength; 1997.

P. ASTM A 490M – Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric); 1993.

Q. ASTM A 500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1999.

R. ASTM A 501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 1999.

S. ASTM A 502 – Standard Specification for Steel Structural Rivets; 1993.

T. ASTM A 514/A 514M – Standard Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 1996.

U. ASTM A 529/A 529M – Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 1996.

V. ASTM A 563 – Standard Specification for Carbon and Alloy Steel Nuts; 1997.

W. ASTM A 563M – Standard Specification for Carbon and Alloy Steel Nuts (Metric); 1997.

X. ASTM A 570/A 570M – Standard Specification for Structural Steel, Sheet and Strip, Carbon, Hot-Rolled; 1998.

Y. ASTM A 572/A 572M – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 1999a.

Z. ASTM A 588/A 588M - Standard Specification for High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick; 1997a.

AA. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 1999.

AB. ASTM E 94 - Standard Guide for Radiographic Testing; 1993.

AC. ASTM E 142 - Standard Method for Controlling Quality of Radiographic Testing; 1992.

AD. ASTM E 164 - Standard Practice for Ultrasonic Contact Examination of Weldments; 1997.

AE. ASTM E 165 - Standard Test Method for Liquid Penetrant Examination; 1995.

AF. ASTM E 709 - Standard Guide for Magnetic Particle Examination; 1995.

AG. ASTM F 436 - Standard Specification for Hardened Steel Washers; 1993.

AH. ASTM F 959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners; 1999a.

AI. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1998.

AJ. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 2000.

AK. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

AL. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

AM. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

AN. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate cambers and loads.

4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC "ASD Manual of Steel Construction".

B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

C. Maintain one copy of each document on site.

D. Fabricator: Company specializing in performing the work of this section with minimum three years of documented experience.

E. Erector: Company specializing in performing the work of this section with minimum three years of documented experience.

F. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MATERIALS

A. Structural Steel Members: ASTM A 36/A 36M.

B. High-Strength, Corrosion-Resistant Structural Steel: ASTM A 242/A 242M.

C. High-Strength, Carbon-Manganese Structural Steel: ASTM A 529/A 529M.

D. High-Strength, Columbium-Vanadium Steel: ASTM A 572/A 572M.

E. Cold-Formed Structural Tubing: ASTM A 500, Grade B.

F. Hot-Formed Structural Tubing: ASTM A 501, seamless or welded.

G. Steel Bars: ASTM A 108.

H. Steel Plate: ASTM A 514/A 514M.

I. Steel Sheet: ASTM A 570/A 570M, Grade 30 hot-rolled, or ASTM A 611, Grade B cold-rolled.

J. Pipe: ASTM A 53/A 53M, Grade B, Finish black.

K. Shear Stud Connectors: Made from ASTM A 108 Grade 1015 bars.

L. Sag Rods: ASTM A 36/A 36M.

M. Carbon Steel Bolts and Nuts: ASTM A 307, Grade A galvanized to ASTM A 153/A 153M, Class C for galvanized structural members.

N. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, medium carbon, galvanized.

O. High-Strength Structural Bolts: ASTM A 490 (ASTM A 490M), with matching ASTM A 563 (ASTM A 563M) nuts and ASTM F 436 washers; Type 1 alloy steel.

P. Anchor Bolts: ASTM A 307, Grade C.

Q. High-Strength Anchor Bolts: ASTM A 325, Type 1 medium carbon, plain.

R. Welding Materials: AWS D1.1; type required for materials being welded.

S. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C 1107 and capable of developing a minimum compressive strength of 7,000 psi (48 MPa) at 28 days

T. Shop and Touch-Up Primer: Fabricator's standard.

U. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors.

D. Develop required camber for members.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC "Allowable Stress Design Specification for Structural Joints Using ASTM A325 or A490 Bolts".

E. Do not field cut or alter structural members without approval of Architect.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 05210 – STEEL JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Open web steel joists and shear stud connectors, with bridging, attached seats and anchors.

B. Loose bearing plates and anchor bolts for site placement.

C. Supplementary framing for floor and roof openings greater than 18 inches (450 mm).

1.02 RELATED SECTIONS

A. Section 05120 – Structural Steel: Superstructure framing.

B. Section 05310 – Steel Deck: Support framing for openings less than 18 inches (450 mm) in decking.

C. Section 05500 – Metal Fabrications: Non-framing steel fabrications attached to joists.

1.03 REFERENCES

A. AISC S329 – Allowable Stress Design Specification for Structural Joints Using ASTM A325 or A490 Bolts; American Institute of Steel Construction, Inc.; 1985, Reaffirmed 1994.

B. AISC S345L – Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts; American Institute of Steel Construction, Inc.; 1994.

C. ASTM A 36/A 36M – Standard Specification for Carbon Structural Steel; 1997a.

D. ASTM A 108 – Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality; 1999.

E. ASTM A 123/A 123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 1997a.

F. ASTM A 153/A 153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1998.

G. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 1997.

H. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 1997.

I. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 1997.

J. ASTM A 490 - Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength; 1997.

K. ASTM E 94 - Standard Guide for Radiographic Testing; 1993.

L. ASTM E 142 - Standard Method for Controlling Quality of Radiographic Testing; 1992.

M. ASTM E 164 - Standard Practice for Ultrasonic Contact Examination of Weldments; 1997.

N. ASTM E 165 - Standard Test Method for Liquid Penetrant Examination; 1995.

O. ASTM E 709 - Standard Guide for Magnetic Particle Examination; 1995.

P. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 2000.

Q. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

R. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

S. SJI (SPEC) - Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; Steel Joist Institute; 1994, Fortieth Edition.

T. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; Steel Joist Institute; 1987.

U. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

V. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society

for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

W. SSPC-Paint 25.1 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel; Society for Protective Coatings; 1997

X. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1995 (Part of Steel Structures Painting Manual, Vol. Two).

Y. SSPC-SP 3 - Power Tool Cleaning; Society for Protective Coatings; 1995 (Part of Steel Structures Painting Manual, Vol. Two).

Z. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.

C. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Perform Work, including that for headers and other supplementary framing, in accordance with SJI Standard Specifications Load Tables and SJI Technical Digest No.9.

C. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

D. Erector Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Joists:
   1. Dale/Incor.
   2. Marino/Ware.
   3. Vulcraft.

2.02 MATERIALS

A. Open Web Joists:SJI Type K Joists:
   1. Provide bottom chord extensions as indicated.
   2. End bearing of 2-1/2 inches (62 mm) on steel supports.
   3. End bearing of 4 inches (100 mm) on masonry supports.
   4. Finish: Shop primed.

B. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A 36/A 36M.

C. Welding Materials: AWS D1.1; type required for materials being welded.

D. Shop and Touch-Up Primer: SSPC-Paint 25.1, zinc oxide.

E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.03 FABRICATION

A. Drill holes in chords for attachment of wood nailers where indicated.

B. Frame special sized openings in joist web framing as detailed.

2.04 FINISH

A. Galvanize joists as specified.
   1. Galvanize steel ledge angles.
   2. Leave other steel members unprimed.

B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

C. Galvanizing: Provide minimum 1.3 oz/sq ft (390 g/sq m) galvanized coating to ASTM A 123.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 ERECTION

A. Erect joists with correct bearing on supports.

B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.

C. Coordinate placement of anchors in concrete construction for securing bearing plates.

D. After joist alignment and installation of framing, field weld joist seats to bearing plates.

E. Position and field weld joist chord extensions and wall attachments as detailed.

F. Install supplementary framing for floor and roof openings greater than 18 inches (450 mm).

G. Do not permit erection of decking until joists are braced bridged, and secured or until completion of erection and installation of permanent bridging and bracing.

H. Do not field cut or alter structural members without approval of joist manufacturer.

I. After erection, prime welds, damaged shop primer, damaged galvanizing, and surfaces not shop primed, except surfaces specified not to be primed.

3.03 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm).
B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 05310 – STEEL DECK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Steel roof deck and accessories.
2. Framed openings up to 10 inches by 10 inches.
3. Welding, fasteners, and accessories for attachment of deck.

B. Related Documents: The Contract Documents, as defined in Section 01010 – Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

B. Related Sections:
1. Section 05120 – Structural Steel: Support framing for openings larger than 10 inches x 10 inches.
2. Section 05210 – Steel Joists: Support framing for steel decking.

1.2 REFERENCES

A. American Iron and Steel Institute (AISI):
1. Specification for the Design of Cold-Formed Steel Structural Members.

B. American Society for Testing and Materials (ASTM):
1. ASTM A 611 – Specification for Structural Steel, Sheet, Carbon, Cold-Rolled.

C. American Welding Society (AWS):
1. AWS D1.1 – Structural Welding Code.
2. AWS D1.3 – Structural Welding Code – Sheet Steel.

D. Steel Deck Institute (SDI):
1. Design Manual for Composite Decks, Form Decks, Roof Decks, (Publication No. 25).
   a. Code of Recommended Standard Practice.
   b. Specifications and Commentary for Steel Roof Deck.
2. SDI Diaphragm Design Manual 1st Edition.

E. Steel Structures Painting Council (SSPC):
1. SSPC-Paint 20 Type II – Zinc Rich Primers – Organic.
2. SSPC-Paint 25 – Red Iron Oxide, Zinc Oxide, Raw Linseed Oil, and Alkyd Primer.

1.3 SUBMITTALS

A. Section 01300 – Administrative Requirements: Procedures for submittals.
1. Product Data: Deck profile characteristics and dimensions, structural properties, and finishes.
2. Shop Drawings: Indicate deck plan, support locations, projections, openings and reinforcement, pertinent details, and accessories.
3. Assurance/Control Submittals:
   a. Certificates: Certify welders employed on Work, verifying AWS qualification within previous 12 months.
   b. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Fabricator: Company specializing in performing the work of this section with minimum 5 years documented experience.

2. Erector: Company specializing in performing the work of this section with minimum 5 years documented experience, certified by AISC Quality Certification Program.
3. Qualifications for Welding Work: Qualify welding operators in accordance with AWS Standard Qualification Procedures. Provide certification that welders employed in work have satisfactorily passed AWS qualification tests within previous 12 months. If recertification of welders is required, provide without additional cost to the Owner.

1.5 DELIVERY, STORAGE AND HANDLING

A. Transport, handle, store, and protect Products.

B. Prevent damage to edges, ends and surfaces.

C. Cut plastic wrap to encourage ventilation. Keep materials dry.

D. Separate sheets and store materials on dry wood sleepers off ground or concrete; slope for positive drainage.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Steel: Contractor option.
1. ASTM A 446, Grade A structural quality; with G60 or G90 galvanized coating conforming to ASTM A 525.
2. ASTM A 611, Grade C, prime painted.

B. Bearing Plates and Angles: ASTM A 36 steel.

C. Welding Materials: AWS D1.1.

D. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

E. Touch-Up Primer for Galvanized Surfaces: SSPC 20, Type 1, inorganic.

F. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to decking.

G. Closure Strips, Cover Plates, and related Accessories: Fabricated of metal of same type and finish as deck.

H. Screw Fasteners: Self-drilling, self tapping No. 12 HWH Teks, by ITW-Buildex Corp., Itasca, IL, (800) 323-0720.
1. Substitutions: Permitted

I. Powder Actuated Fasteners: Minimum 0.145 inch diameter knurled hardened steel shank; minimum 0.5625 inch diameter washer; meet SDI design requirements.
1. ENP2-21-L15, by Hilti, Inc., Tulsa, Oklahoma, (918) 252-6000, (800) 879-8000.
2. Substitutions: Permitted.

J. Air Actuated Fasteners: Minimum 0.130 inch diameter knurled hardened steel shank; minimum 0.500 inch diameter steel washer or head; meet SDI design requirements.
1. X-EDNK22 HSN or X-EDN19 HSN, by Hilti, Inc., Tulsa, Oklahoma, (918) 252-6000.
2. K-65056 or SDK-63075, by Pneutek, Inc., Hudson, New Hampshire, (603) 883-1660, (800) 431-8665.
3. Substitutions: Permitted.

K. Side Lap Fasteners: Self-drilling screws; #10-16 TEKS/1, by ITW-Buildex Corp., Itasca, IL, (800) 323-0720, or acceptable substitute.

2.2 FABRICATION

A. Steel Roof Deck: Minimum gage sheet steel in height as indicated on Drawings, fluted profile to comply with the requirements given on the drawings; multiple span; lapped joints.

B. Fabricate metal decking in accordance with the SDI Design Manual for Composite Decks, Form Decks, Roof Decks, and AISI, to accommodate maximum working stress of 20,000 psi and maximum span deflection of 1/240.

C. Fabricate roof sump pan of 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01700 - Execution Requirements: Verification of existing conditions before starting work.

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to Contracting Officer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 INSTALLATION

A. Erect metal decking and connect to structure in accordance with SDI Design Manual for Composite Decks, Form Decks, Roof Decks. Coordinate attachment sequence and procedure with placing of units; show on shop drawings.

B. On steel support members provide 1-1/2 inch minimum bearing. On masonry support surfaces provide 3 inch minimum bearing.

C. Align and level deck on supports.

D. Provide welds, fasteners, and side lap connectors of size, spacing, and location as indicated on Drawings.

E. Install Hilti powder actuated fasteners using the DX-450 or DX-750 decking system, by Hilti. Installed pin height shall be in accordance with manufacturer's recommendations, and verified with manufacturer approved inspection gage. Determine power level by jobsite testing.

F. Install Hilti air actuated fasteners using the R4x12 decking system, by Hilti. Installed pin height shall be in accordance with manufacturer's recommendations, and verified with manufacturer approved inspection gage. Determine power level by jobsite testing.

G. Install Pneutek air actuated fasteners using decking system, by Pneutek. Install pins in accordance with manufacturer's recommendations. Pin head shall clamp deck tightly to supporting member without gaps between underside of head and top side of deck. Pin shall not cause excessive dimpling of the deck greater than 1/2 the thickness of the pin head.

H. Powder and air actuated fasteners shall be installed by a tool operator licensed by the pin manufacturer. A representative of the pin manufacturer shall be on site to verify proper installation of fasteners, and shall submit written verification to Owner.

I. Welding: In accordance with AWS D1.1 and D1.3. Provide welding washers when welding 26 gauge or lighter steel deck.

J. Install 6 inch wide sheet steel cover plates where deck changes direction. Spot weld in place 12 inches on center maximum. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.

K. Position roof sump pans with flange bearing on top surface of deck. Weld at each deck flute.

L. Immediately after welding deck in place, touch-up welds, burned areas, and surface coating damage with prime paint.

3.3 FIELD QUALITY CONTROL

A. Section 01400 - Quality Control: Field testing and inspection.

B. Inspection:
   1. Select 6 random sheets for each type of deck used. Inspect for deck thickness, type, and material.
   2. Inspect 10 percent of deck welds over entire roof area for size and spacing (CWI to perform inspection).
   3. Inspect 10 percent of side lap connectors over entire roof area for type, size, and spacing of side lap connectors.

END OF SECTION

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Exterior non-load-bearing wall framing.

1.2 PERFORMANCE REQUIREMENTS

   a. Structural Performance: Provide cold-formed metal framing as indicated on the drawings.

1.3 SUBMITTALS

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

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification data.

E. Product test reports.

F. Research/evaluation reports.

1.4 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Sheet Steel."

C. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and it's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G90 (Z275) or equivalent.

2.2 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges as required to meet wind load conditions.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.

2.3 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members, unless otherwise indicated.

B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.4 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

3.2 INSTALLATION, GENERAL

A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

C. Install framing members in one-piece lengths.

D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

E. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.4 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensures that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete: Placement of metal fabrications in concrete.

B. Section 09900 - Paints and Coatings: Paint finish.

1.03 REFERENCES

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 1992.

B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1997a.

1.05 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A 36/A 36M.

B. Plates: ASTM A 283.

C. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M) galvanized to ASTM A 153/A 153M for galvanized components.

D. Welding Materials: AWS D1.1; type required for materials being welded.

E. Shop and Touch-Up Primer: SSPC-Paint 15, Type I - Red Oxide.

F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by intermittent welds and plastic filler.

D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FINISHES - STEEL

A. Prime paint all steel items.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated.

D. Perform field welding in accordance with AWS D1.1.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Types of work in this section include rough carpentry for wood framing, wood nailers and blocking, and wood sheathing.

B. Prefabricated wood trusses are specified in another Division-6 section.

1.02 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

2.01 LUMBER AND PANEL PRODUCTS, GENERAL

A. Lumber Standards: Manufacture lumber to comply with 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 at time of surfacing, and mill. **Exposed lumber: Grade stamp shall be sanded/removed before installation.**

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.

D. Dimension Lumber: For light framing (2" to 4" wide) provide Construction Grade lumber any species. All interior or exterior lumber shall be kiln dried after treatment lumber without tint.

E. Construction Panels: Comply with PS 1 "U.S Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS 1provisions, with American Plywood Association (APA) "Performance Standard and Policies for Structural-Use Panels," Form No. E445.

1. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

2. Plywood Roof Sheathing/Wall Sheathing: Provide APA Performance-Rated Panels Complying with requirements indicated for grade designation, span rating, exposure durability classification and thickness.

a. Grade Designation: APA RATED SHEATHING.
b. Exposure Durability Classification: EXTERIOR.
c. Span Rating: To suit framing spacing indicated.
d. Thickness: As indicated on drawings.

2.02 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. Provide fasteners and anchorages with a hot-dip coating (ASTM A 153).

B. Building Paper: ASTM D 226, Type I; asphalt saturated felt, non-perforated, 15-lb. Type or as noted on drawings.

2.03 WOOD TREATMENT BY PRESSURE PROCESS

A. Preservative Treatment: Where lumber or plywood is indicated as "P.T." or "Treated," or is specified herein to be treated, comply with applicable requirements of AWPB Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark Requirements. All interior or exterior lumber shall be kiln dried after treatment lumber without tint.

B. Pressure-treat all designated dimensions with water-borne preservatives to comply with AWPB LP-2. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted. All wood corners shall be mitered.

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

3.02 NAILERS AND BLOCKING

A. Provide wherever shown and where required for 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.

3.03 WOOD FRAMING, GENERAL

A. Provide framing members of sizes and on spacings shown, and frame openings as shown, or if not shown, comply with recommendations of "Manual for House Framing" of National Forest Products Association (N.F.P.A).

B. Anchor and nail as shown, and to comply with "Recommended Nailing Schedule" of "Manual for House Framing" and "National Design Specifications for Wood Construction" published by N.F.P.A.

C. Stud Framing, General: Provide stud framing of size and spacing indicated. Arrange studs so wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using 2" thick members with widths equaling that of studs; except single top late may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. General: Comply with applicable recommendations contained in Form No. E 30F, "APA Design/Construction Guide – Residential & Commercial," for types of construction panels and applications indicated.

B. Fastening Methods: Fasten sheathing panels by nailing to framing.

END OF SECTION

SECTION 06200 FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

1.02 RELATED SECTIONS

A. Section 08211 – Flush Wood Doors.

B. Section 08800 – Glazing; Glass and glazing of wood partitions and screens.

C. Section 09900 – Paints and Coatings: Painting and finishing of finish carpentry items.

1.03 REFERENCES

A. ANSI A208.1 – American National Standard for Particleboard; 1999.

B. ASTM C 1036 – Standard Specification for Flat Glass; 1991 (Reapproved 1997).

C. ASTM C 1048 – Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass; 1997b.

D. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials; 1999.

E. AWI P-200 – Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.

F. AWPA C2 – Lumber, Timber, Bridge Ties and Mine Ties – Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 1999.

G. NEMA LD 3 – High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 1995

H. PS 1 – Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.

1.04 SUBMITTALS

A. See Section 01300 – Administrative Requirements for submittal procedures.

B. Product Data:

1. Provide data on fire retardant treatment materials and application instructions.

2. Provide instructions for attachment hardware and finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, Accessories, to a minimum scale of 1-1/2 inch to 1 ft.

D. Samples: Submit two samples of finish plywood. 12 x 12 inch in size illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim 12 inch long.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom grade.

B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum three years of documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire retardant requirements.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Protect work from moisture damage.

1.08 PROJECT CONDITIONS

A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious Manner.

B. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated And adjacent components.

PART 2 PRODUCTS

2.01 LUMBER MATERIALS

A. Softwood Lumber: NIST PS 20 and grade in accordance with the grading rules of the grading And inspection agency applicable to the species, maximum moisture content of 19 percent; With vertical grain.

B. Hardwood Lumber: A-C Grade in accordance with the grading rules of the grading and Inspection agency applicable to the species; maximum moisture content of 6 percent; with Vertical grain.

2.02 SHEET MATERIALS

A. Softwood Plywood: PS 1 Grade A-b: Veneer core; face species, cut.

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

2.03 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3, HGS; color as selected; textured, low gloss finish.

2.04 ADHESIVE

A. Adhesive: Type recommended by laminate manufacturer to suit application.

2.05 FASTENERS

A. Fasteners: Of size and type to suit application; finish in concealed locations and finish in exposed locations.

2.06 ACCESSORIES

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

B. Plastic Edge Trim: Extruded convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness; color as selected.

C. Plain Glass (Float): ASTM C 1036 annealed float glass, clear, 6 mm thick minimum.

D. Safety Glass: Laminated glass complying with 16 CFR 1201 and ANSI Z97.1; clear; nominally 6 mm thick.

E. Primer: Alkyd primer sealer type.

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

2.07 WOOD TREATMENT

A. Wood Preservative by Pressure Treatment (PT Type): AWPA Treatment C2 using water borne preservative with 0.25 percent retainage. All interior or exterior lumber shall be kiln dried after treatment lumber without tint.

2.08 FABRICATION

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

B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.

C. Cap exposed plastic laminate finish edges with plastic trim.

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

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

2.09 SHOP FINISHING

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

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

C. Finish work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Section 1500, System TR-2 (Transparent).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

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

3.02 INSTALLATION

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

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

C. Install hardware in accordance with manufacturer's instructions.

3.03 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.

B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.04 PREPARATION FOR SITE FINISHING

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

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

3.05 ERECTION TOLERANCES

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

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

END OF SECTION

SECTION 06410 LAMINATE-CLAD CASEWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Laminate-clad cabinets (plastic-covered casework).
2. Plastic-laminate countertops.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 8 Section "Flush Wood Doors" for doors specified by reference to architectural woodwork standards.
2. Division 9 Section "Paints and Coatings" for field finishing of installed interior architectural woodwork.

1.03 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

D. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.

1. Plastic laminates.

E. Samples for verification of the following:

1. Laminate-clad panel products, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.

2. Exposed cabinet hardware, one unit for each type and finish.

F. Product certificates signed by woodwork fabricator certifying that products comply with specified requirements.

G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.

B. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.

C. Single-Source Responsibility for Fabrication and Installation: Engage a qualified woodworking firm to assume undivided responsibility for fabricating, finishing, and installing woodwork specified in this Section.

D. Quality Standard: Except as otherwise indicated, comply with the following standard:

1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.

1.08 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved schedule for cabinet hardware specified in Division 8 Section "Door Hardware" to fabricator of architectural woodwork; coordinate cabinet shop

drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2.
3. Particleboard: Industrial Grade 45ib density accredited, ANSI A208.1, Grade M3.
4. Softwood Plywood: PS 1.

B. Formaldehyde Emission Level for Medium-Density Fiberboard: Comply with requirements of NPA 9.

C. Particleboard: Industrial Grade 45ib density accredited, ANSI A208.1, Grade M3.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard. Provide GP28 for cabinet exposed fronts and sides.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated in the Work include, but are not limited to, the following:

a. Formica Corporation.
b. Laminart.
c. Nevamar Corp.
d. Ralph Wilson Plastics Co.

2.02 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Finish Hardware."

B. Cabinet Hardware Schedule: Refer to schedule below for cabinet hardware required for architectural cabinets.

Item	Identification No.	Location
Door Hinges	Blum Clip 110,mid range	All Casework Doors
Drawer Slides	Knap & Vogt 1300	2 per Drawer
Drawer Pulls - 6"	Stanley 4485	1 per Drawer
Door Pulls - 6"	Stanley 4485	1 per Door
Magnet Catch	Stanley 41ALD	1 per Door
Lock	Best Lock 5E Series Straight Cam	1 per Door & 1 per Drawer (In Room 119B & 120B-all cabinet doors/drawers)

C. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.

1. Nickle Finish.

E. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

2.03 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.

1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.

C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

2.04 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:

1. Grade: Premium.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of cabinets and edges of solid-wood (lumber) members and rails: 1/16 inch (1.5 mm).

D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

F. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

G. Fit shelves, doors, and exposed edges with 3/8 inch (9.5 mm) matching hardwood edging. Use one piece for full length only.

H. Cap exposed PVC finish edges with material of same finish and pattern.

I. Door and Drawer Fronts: 3/4 inch (19 mm) thick; flush style.

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

K. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet (600 mm) from sink cut-outs.

L. Apply wood laminate by grain matching adjacent sheets to book matching.

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

N. Fabricate metal countertop surfaces pressure glued to plywood core backing with butt joints.

O. Mechanically fasten back splash to countertops with steel brackets at 16 inches (400 mm) on center.

P. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

Q. Shop glaze glass materials using the Interior Dry method specified in Section 08800.

2.05 LAMINATE-CLAD CABINETS (PLASTIC-COVERED CASEWORK)

A. Quality Standard: Comply with AWI Section 400 requirements for laminate-clad cabinets.

B. Quality Standard: Comply with WIC Section 15, "Plastic-Covered Casework."

1. Grade: Premium.

C. AWI Type of Cabinet Construction: Flush overlay.

D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other than Tops: GP-28.
2. Vertical Surfaces: GP-28
3. Edges: PVC 3mm

E. Materials for Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other than Drawer Bodies: High-pressure decorative laminate, Grade GP-28.
2. Drawer Sides and Backs: Thermoset decorative overlay.
3. Drawer Bottoms: Thermoset decorative overlay.

F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Provide Architect's selections from laminate manufacturer's full range of colors and finishes in the following categories:

a. Solid colors.
b. Patterns.
c. Matrix colors.

G. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers except where located directly under tops.

2.06 COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 requirements for countertops.

1. WIC Section 14, "Wood Casework."
2. WIC Section 16, "Laminated Plastic Countertops, Splashes and Wall Paneling."
3. Grade: Premium.

   a. Provide Architect's selections from manufacturer's full range of colors and finishes in the following categories:

      1) Solid colors.
      2) Patterns.
      3) Matrix Colors.

4. Edge Treatment: PVC 3mm banding, machine trimmed and applied with waterproof hot melt glue.
5. Core Material: Exterior-grade plywood.

PART 3 - EXECUTION

3.01 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.02 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level (including tops).

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Do not use pieces less than 36 inches (900 mm) long, except where necessary. Stagger joints in adjacent and related members. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.

   1. Install standing and running trim with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) variation from a straight line.

F. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide

unencumbered operation. Complete the installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.

G. Tops: Anchor securely to base units and other support systems as indicated. Calk space between backsplash and wall with specified sealant.

1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.

H. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in the shop.

I. Refer to Division 9 Sections for final finishing of installed architectural woodwork.

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.04 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

3.05 CABINET HARDWARE AND ACCESSORY SCHEDULE

A. BHMA numbers are used below to designate hardware requirements, except as otherwise indicated.

B. Concealed (European Type) Hinges: B01602.

C. Adjustable Shelf Standards: B04071.

1. Shelf Rests for Standards: B04081.

D. Shelf Rests: B04013.

E. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, complying with BHMA A156.9, Grade 1 and rated for the following loads:

1. Box Drawer Slides: 75 lbf (330 N).
2. File Drawer Slides: 150 lbf (670 N).
3. Pencil Drawer Slides: 45 lbf (200 N).

F. Grommets for cable passage through countertops: 3 inch (25 mm) OD brown, molded-plastic grommets with 3/4-inch (19-mm) hole and plastic cap with slot for wire passage.

END OF SECTION

SECTION 07410 METAL ROOF

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Factory-formed metal roofing or soffits, including flashing and accessories.
Metal roofing includes:
Snap-Clad Panels as basis of design, manufactured by PAC-CLAD.

B. Related Sections: Section(s) related to this section include:
1. Metal Roof Deck: Division 5 Metal Deck Sections.
2. Wood Framing and Decking: Division 6 Rough Carpentry Section.
3. Flashing and Trim: Division 7 Flashing and Sheet Metal Section.
4. Coping and Gravel Stops: Division 7 Roof Specialties and Accessories Section.
5. Sealants: Division 7 Joint Sealers Sections.

1:02 REFERENCES

A. American Society for Testing and Materials (ASTM):
ASTM AZ50 - Specification for Steel Sheet, Aluminum-Zinc Alloy Coated (Galvanized) by the Hot Dip Process, General Requirements (Galvalume).
ASTM B209 - Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
ASTM E283/1680 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.
ASTM E331/1646 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Status Air Pressure Difference.
ASTM 1592-95 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference

B. Underwriters Laboratories (UL Classified Tests):

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
1. SMACNA Architectural Sheet Metal Manual

1:03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide sheet metal roofing that has been manufactured, fabricated and installed to withstand structural and thermal movement, wind loading and weather exposure to maintain manufacturer's performance criteria without defects, damage, failure of infiltration of water.
1. Wind-Uplift: Roof panel assembly shall comply with UL Classification 580 for UL Classified 90 rated assemblies
2. Static Air Infiltration: Completed roof system shall have a maximum of .06 cfm/sf with 6.24kPa air pressure differential as per ASTM E283/1680.
3. Water Infiltration: No evidence of water penetration at an inward static air pressure differential of not less than 6.24 psf (43 kPa) and not more than 12.0 psf (83 kPa) as per ASTM E331/1646.

1:04 SUBMITTALS

A. General: Submit listed submittals in accordance with *Conditions of the Contract* and

Division 1 Submittal Procedures Section.

1. Product Data: Submit product data, including manufacturer's SPEC-DATA product sheet, for specified products. (Make Spec-Data link to information located in the product section.

B. Shop Drawings:

1. Submit complete shop drawings and erection details, approved by the metal roofing manufacturer, to the architect (owner) for review. Do not proceed with manufacturer of roofing materials prior to review of shop drawings and field verification of all dimensions. Do not use drawings prepared by the architect (owner) for shop or erection drawings.
2. Shop drawings show roof plans, elevations, methods of erection, and flashing details.

C. Performance Tests:

1. Submit certified test results by a recognized testing laboratory in accordance with specified test methods for each panel system.

D. Samples: Submit selection and verification samples for finishes, colors and textures.

E. Quality Assurance Submittals: Submit the following:

1. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
2. Manufacturer's Instructions: Manufacturer's installation instructions.

F. Closeout Submittals: Submit the following:

1. Operation and Maintenance Date: Operation and maintenance date for installed products in accordance with Division 1 Closeout Submittals, Maintenance Data and Operation Data Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Project Warranty: Warranty documents specified herein.

   A: Manufactures warranty: Submit, for owners acceptance, manufactures standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not limited of, other rights the owner may have under the contract documents.

   1. Warranty Period: (specify term) years commencing on Date of Substantial Completion.
3. Record Documents: Project record documents for installed materials in accordance with Division 1 Closeout Submittals,, Project Record Documents Section.

1:05 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.

1. Certificate: When requested, submit certificate indicating qualifications.

B. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association(SMACNA) *Architectural Sheet Metal Manual*.

C. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, Manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Managements and

Coordination, Project Meetings Section.

1:06 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

1. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Identify fabricated components with UL 90 Classified label where appropriate.

C. Storage and Protection: Store materials protected from exposure to harmful conditions. Store material in dry, above ground location.

1. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture to run off.
2. Prevent contact with material that may cause corrosion, discoloration or staining.
3. Do not expose to direct sunlight or extreme heat trim material with factory applied strippable film.

1:07 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1:08 WARRANTY

A. Project Warranty: Refer to *Conditions of the Contract* for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of, other rights Owner may have under the Contract Documents.

1. Warranty Period: (20) years commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2:01 SHEET METAL ROOFING

A. Manufacturer: Petersen Aluminum Corporation

1. Contact: 1005 Tonne Road, Elk Grove Village, IL 60007; Telephone (800) 323-1960, (847) 228-7150; Fax (800) 722-7150

B. PAC-CLAD SNAP-CLAD panels and trim:

1. Seam Height: 1 ¾"(44 mm) minimum seam height.
2. Material: 24 ga G-90 Hot-dipped Galvanized Steel
3. Panel Dimension: 16in (406mm) o.c.
4. Eave Notching: (Factory produced eave notching for trimmed eave panels)
5. Texture: Smooth
6. Rating: UL Classified 90 rated (wind uplift) panel assembly.
7. Flashing and Trim: 24 ga G-90 Steel
8. Fasteners: SNAP-CLAD galvanized steel, non-penetrating high performance clips

for roofing application and UL Classified 90 rated (wind uplift) assemblies and standard clips for mansard and fascia applications.

C. Panel Finish:

1. Panel Topside: PAC-CLAD finish' color selected from Petersen Aluminum Corp. standard colors:

2. Panel Underside: Polyester washcoat with dry film thickness of 0.3 mils.

D. PAC-CLAD Flashing and Trim: Manufacturer's standard flashing and trim profiles, factory formed, gauge as recommended by manufacturer, color and finish to match metal roofing panels.

E. Substitutions: No substitutions permitted.

2:02 RELATED MATERIALS

A. General: Coordinate use of related materials:

1. Underlayment: ASTM D226, Type II No. 30 asphalt saturated organic roofing felt. Refer to Division 7 Roofing Sections.

2. Densgrass Deck: ½" nominal thickness. Refer to Division 6 Rough Carpentry Section.

3. Nailable Insulation: 1" (25 mm) minimum to 3 ½" (89 mm) maximum nominal thickness classified polyisocyanurate foamed plastic, 2 pct density, with factory laminated 7/16" (11 mm) thick APA rated Oriented Strant Board (OSB). Refer to Division 7 Insulation Sections or Division 6 Rough Carpentry Section.

4. Sealants: Elastometic joint sealants. Refer to Division 7 Joint Sealers Sections.

5. Bituminous Coating: Cold-applied asphaltic mastic. Provide compound free of asbestos fibers, sulfur components and other harmful impurities. Refer to Division 7 Damp proofing Section.

2:03 FABRICATION

A. General:

1. Continuous Length: Fabricate panels 55' (16.2 m) and less in one continuous length.

2. Trim and Flashings: Fabricate trim and flashings from same material as roof system material.

3. Portable Roll Former: Panels fabricated by portable roll former shall not be approved.

2:04 FINISHES

A. PAC-CLAD Factory Applied Finish:

1. Topside: Full-strength fluoropolymer (70% Kynar□ 500 or Hylar□ resin) system of 1.0 mil (.025 mm) total dry film thickness.

2. Underside: Wash coat of 0.3 - 0.4 mil dry film thickness.

3. Texture: (Smooth texture, dull matte specular gloss 25 - 35% at 60□) (Standard E-5 stucco embossed pattern).

4. Protective film: Strippable vinyl film applied during panel fabrication and finishing.

PART 3 EXECUTION

3:01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, recommendations and installations instructions for substrate verification, preparation requirements and installation.

1. Strippable Film: Remove manufacturer's protective film, if any, from surfaces of roofing panels.

3:02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for project installation in accordance with manufacturer's instructions.

3:03 PREPARATION

A. Coordination: Coordinate metal roofing with other Work (drainage, flashing and trim, deck substrates, parapets, copings, walls) and other adjoining work to provide a non-corrosive and leak-proof installation.

B. Dissimilar Metals: Prevent galvanic action of dissimilar metals.

3:04 INSTALLATION

A. General: Install metal roofing panels to profiles, patterns and drainage indicated and required for leak-proof installation. Provide for structural and thermal movement at work. Seal joints for leak-proof installation.

1. Seams: Provide uniform, neat seams.
2. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leak-proof installation.
3. Sealant-Type Joints: Provide sealant-type joint where indicated. Form joints to conceal sealant. Comply with Division 7 Joint Sealants Section for Sealant installation.

3:05 FIELD QUALITY REQUIREMENTS

A. Site Tests (Post Installation Testing): Owner reserves right to perform post installation testing of installed sheet metal roofing.

B. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions

3:06 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3:07 PROTECTION

A. Protection: Protect installed product from damage during construction.

END SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
   1. Asphaltic modified bituminous roofing

B. Related Sections
   1. Section 06100: Rough Carpentry
   2. Section 07620: Sheet Metal Flashing and Trim
   3. Section 15430: Plumbing Specialties

1.02 REFERENCES

A. Factory Mutual (FM Global) – *Approval Guide*

B. Underwriters Laboratories (UL) – *Roofing Systems and Materials Guide* (TGFU R1306)

C. American Society for Testing and Materials (ASTM) – *Annual Book of ASTM Standards*

D. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) – *Architectural Sheet*
Metal Manual

E. Asphalt Roofing Manufacturers Association (ARMA)

F. National Roofing Contractors Association (NRCA)

G. American Society of Civil Engineers (ASCE)

1.03 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) *Roofing and Waterproofing Manual* for definitions of roofing terms related to this section.

1.04 PERFORMANCE REQUIREMENTS

A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.

B. General Contractor shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.05 SUBMITTALS

A. Product Data: Provide product data sheets for each type of product indicated in this section.

B. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified.

C. Samples: Provide samples of insulation(s), fasteners and roll goods for verification of quality.

D. Certificates: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain the warranty specified in this section.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications: General Contractor shall provide a roofing system that meets or exceeds all criteria listed in this section.

B. Installer's Qualifications:
1. Installer shall have 20 years experience with installing product and specified roofing field.

C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer.

D. Final Inspection
Manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed and final punch list completed.

1.07 PRE-INSTALLATION CONFERENCE

A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect, owner, owners representative, general contractor, roofing subcontractor and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

1.08 REGULATORY REQUIREMENTS

A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.

1.09 DELIVERY, STORAGE AND HANDLING

A. Deliver all roofing materials to the site in original containers, with factory seals intact. All products are to carry manufactures label.

B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.

C. Store roll goods on end on pallets in a clean, dry, protected area. Take care to prevent damage to roll ends or edges. Do not double stack modified bitumen products.

D. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.

E. Remove manufacturer supplied plastic covers from materials provided with such. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material is to be installed.

F. Materials shall be stored above 55°F (12.6°C) a minimum of 24 hours prior to application.

1.10 PROJECT CONDITIONS

A. Weather
   1. Proceed with roofing only when existing and forecasted weather conditions permit.
   2. Ambient temperatures must be above 45°F (7.2°C) when applying hot asphalt or water based adhesives.

1.11 WARRANTY

A. Provide Manufacturers Standard Guarantee with single source coverage and no monetary limitation, where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship.
   1. Duration: Twenty (20) years from the date of completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. GAF Materials Corporation
B. Hydro-Stop and United Coating are QCP Companies
C. Derbigum

D. Flex Roofing Systems
E. Firestone Building Products Company, LLC
F. Mule-Hide Products Co., Inc.
G. TAMKO Building Products, Inc.
H. Polyglass, USA

2.02 INSULATION ACCESSORIES

A. Cant Strip: Factory fabricated rigid perlite strip cut at angles to provide a true 45° Angle between horizontal and vertical surfaces.

2.03 BASE / PLY SHEETS

A. Heavyweight asphalt coated glass fiber base sheet: Conforms to or exceeds requirements of ASTM D 4601, Type II, UL Type G2 BUR, and Federal Spec SS-R-620B Type II. Each roll contains three (3) squares (320 sq. ft.) of material, approximately 39.4" x 97.5' (1 m x 29.7 m); 75 lbs. (34.1 kg), base sheet.

B. Premium glass fiber asphalt saturated ply sheet with flexible design: Conforms to or exceeds requirements of ASTM D 2178 Type VI and UL Type G1 BUR. Each roll contains five (5) squares (530 sq. ft.) of material, approximately 39.4" x 161.8' (1.0m x 49.3m), 44 lbs. (20 kg).

2.04 MEMBRANE MATERIALS

A. ENERGY STAR listed, fire resistant, coated granule surfaced modified bitumen sheet containing a core of non-woven glass fiber mat coated with flexible SBS polymer-modified asphalt. Conforms to or exceeds the requirements of ASTM D 6163 Type I Grade G. Each roll contains one square of material, approximately 39.4" x 33.7' (1 m x 10.3 m), 98.4 lbs. (44.6 kg), roof membrane.

2.05 FLASHING MATERIALS

A. Heavyweight asphalt coated glass fiber base sheet: Conforms to or exceeds requirements of ASTM D 4601, Type II, UL Type G2 BUR, and Federal Spec SS-R-620B Type II. Each roll contains three (3) squares (320 sq. ft.) of material, approximately 39.4" x 97.5' (1 m x 29.7 m); 75 lbs. (34.1 kg), base sheet.

B. Premium glass fiber asphalt saturated ply sheet with flexible design: Conforms to or exceeds requirements of ASTM D 2178 Type VI and UL Type G1 BUR. Each roll contains five (5) squares (530 sq. ft.) of material, approximately 39.4" x 161.8' (1.0m x 49.3m), 44 lbs. (20 kg),.

C. Strong, resilient, asphalt modified bitumen membrane containing a core of non-woven polyester mat coated with flexible, SBS polymer-modified asphalt. Conforms to or exceeds requirements of ASTM D 6164 Type I Grade G. Each roll contains one square of material,

approximately 39.4" x 32.56' (1 m x 9.92 m), 90 lbs. (40.8 kg), Mop Granule flashing membrane.

2.06 BITUMEN / ADHESIVES

A. Asphalt Bitumen: ASTM D 312 Type III or IV

B. Asphalt Primer: ASTM D 41

2.07 ACCESSORIES

A. Mechanical Fasteners
   1. Threaded Cap Nail: Annular-threaded electro-galvanized with yellow di-chromate coating, with 1" (25 mm) round or square cap, as manufactured by the Simplex Nail Corporation.

B. Standard Vents
   1. A spun aluminum vent, pre-flashed with modified bitumen designed to waterproof soil pipes and roofing protrusions.

C. Adjustable Vents
   1. A two-piece roof-flashing unit consisting of a pre-flashed spun aluminum base and a flexible upper boot, allowing for waterproofing of tall or awkward roof protrusions.

D. Plumbing Vents
   1. A pre-flashed with modified bitumen membrane and is designed to waterproof vent pipes. It can be used as a pipe cover to replace finger and cap flashing on standard vent pipe details.

E. Drains
   1. A spun aluminum (or copper) roof drain with gravel guard, strainer cap, and waterproofing plumbing seal attached. Pre-flashed with modified bitumen and available in full and insert sizes to accommodate new construction and retrofit applications.

   2. A Pre-flashed metal through-wall roof drain designed for easy installation to aid in quick lateral removal of water.

F. Sealant Pans
   1. A structural urethane outer shell, bonded to the roof surface, filled with a urethane rubber sealant. The urethane sealant conforms to the shape of any roof penetration through a roof surface to protect the roof system from moisture.

G. Expansion Joint Covers
   1. Factory fabricated assemblies used to accommodate three-dimensional joints in a roof structure. Heavy reinforced flexible cover with a flexible flame retardant foam bellows for support. Nailing flanges conform to curb irregularities.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that the surfaces and site conditions are ready to receive work.

B. Verify that the deck is supported and secured.

C. Verify that the deck is cleaned and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.

D. Verify that the deck surfaces are dry and free of ice or snow.

E. Verify that all roof openings, curbs, pipes, sleeves, ducts, vents or other penetrations through the roof are solidly set, and that all flashings are tapered.

3.02 SUBSTRATE PREPARATION

A. Wood Deck (Plank / Heavy Timber)
   1. Wood boards must be at least 1" nominal thickness and have a nominal width of 4'-6". Tongue and groove or shiplap lumber is preferred to square edge material since subsequent shrinkage or warping of square edge planks may cause ridging of the roof system above adjacent boards.
   2. All boards must have a bearing on rafters at each end and be securely nailed.
   3. Lumber should be kiln dried.
   4. Preservatives or fire retardants used to treat decking must be compatible with roofing materials.
   5. Decking should be kept dry and roofed promptly after installation.
   6. Knotholes or large cracks in excess of ¼" (6 mm) shall be covered with securely nailed sheet metal.
   7. Light metal wall ties or other structural metal exposed on top of the wood deck shall be covered with one ply of a heavy roofing sheet, such as Stratavent® Eliminator™ Nailable Base Sheet, extending 2"-6" (5.1 cm - 15.2 cm) beyond the metal in all directions. Nail in place before applying the base ply.
   8. Attach an acceptable base sheet through flat metal caps or use nails with attached 1" (25 mm) square or round metal caps that have a minimum withdrawal resistance of 40 pounds each (178 N).
   9. Tape and staple fastening systems may be used on wood decks when they comply with local building codes.
   10. In all retrofit roof applications, it is required that deck be inspected for defects. Any defects are to be corrected per the deck manufacturer's recommendations and standards of the APA/Engineered Wood Association prior to new roof application.

B. Plywood Deck
   1. Plywood sheathing must be exterior grade, minimum 4 ply, and not less than 15/32" (12 mm) ***dade county*** 19/32" (15 mm) thick.

2. Preservatives or fire retardants used to treat the decking must be compatible with roofing materials.
3. The deck must be installed over joists that are spaced 24" (61 cm) o.c. or less.
4. The deck must be installed so that all four sides of each panel bear on and are secured to joist and cross blocking. "H" clips are not acceptable.
5. Panels must be installed with a 1/8" to 1/4" (3mm – 6mm) gap between panels and must match vertically at joints to within (1/8" (3mm).
6. Decking should be kept dry and roofed promptly after installation.
7. Light metal wall ties or other structural metal exposed on top of the wood deck shall be covered with one ply of a heavy roofing sheet, such as Stratavent® Eliminator™ Nailable Base Sheet, extending 2"–6" (5.1 cm – 15.2 cm) beyond the metal in all directions. Nail in place before applying the base ply.
8. Tape and staple fastening systems may be used on wood decks when they comply with local building codes.
9. Attach an acceptable base sheet through flat metal caps or use nails with attached 1" (25 mm) square or round metal caps that have a minimum withdrawal resistance of 40 pounds each (178 N).

3.03 INSTALLATION – GENERAL

A. Install roofing system according to all current application requirements in addition to those listed in this section.

B. When the slope of the roof is ½" per foot or greater, install all plies parallel with the slope of the roof, and install intermediate wood nailers as required for the specific roof slope. Plies must extend over ridges and nailed on 6" centers.

C. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

3.04 BITUMEN

A. Do not mix different types of asphalt.

B. Use only ASTM D 312, Type III or Type IV Steep Asphalt. Type III asphalt may be used on slopes up to ½" per foot (4cm/m). Type IV asphalt must be used on all slopes greater than ½" per foot (4 cm/m).

C. Application with hot asphalt requires continuous, uniform interply mopping rates of 25 lbs. +/– 20% per 100 square feet of roof area (1.2 kg/m²).

D. Application temperature of the asphalt must be at the Equiviscous Temperature (EVT) with a tolerance of +/– 25°F (13.9°C), at which a viscosity of 125 centipoise is attained. When using mechanical asphalt applicators, the target viscosity should be 75 centipoise.

E. For all SBS modified asphalt flashings; the minimum application temperature of the asphalt must be at the EVT or 425°F (218°C), whichever is greater, with a rolling bank (puddle) of mopping asphalt across the full width of the roll.

F. Do not heat the asphalt to or above its flash point or hold the asphalt at temperatures above the finished blowing temperature for more than 4 hours.

G. Do not keep heated tankers above 325°F (163°C) overnight.

3.05 BASE SHEET

A. Roll the base sheet out over the deck and allow it to relax. Lap the base sheet so the flow of water is over or parallel to, but never against the laps.

B. Lap the base sheet 2" (5.1 cm), and 4" (10.2 cm) on the ends. Keeping the base sheet taut, push out all wrinkles and buckles ahead as fastening proceeds.

C. Turn base sheet up to the top of the cant.

D. Stagger adjacent end laps a minimum of 18" (45.7 cm).

E. A minimum FMRC 1-60 attachment is recommended. Refer to FMRC Approval Guide for FM Fastening patterns. Factory Mutual requires fastener density increases in perimeter and corner zones for FM 1-60 and FM 1-90 or greater. Refer to FM Loss Prevention Data Sheets 1-7, 1-28, 1-29 and 1-49.

Note: When fastening base sheets using screws and plates without insulation, the plate must be of a design that allows it to lie flat on the deck.

3.06 INTERPLY SHEETS

A. Three ply interply application: Install starter strips of 13 1/8" (33.3 cm), 26 1/4" (66.7 cm) and 39 3/8" (100.0 cm) widths and follow with a second full 39 3/8" (100.0 cm) width sheet with a maximum 11 1/8" (28.3 cm) exposure, applied shingle style. Lap felts 2615/16" (68.4cm) with a 127/16" (31.6 cm) exposure and lap 6"(15.2 cm) at ends. Stagger adjacent end laps a minimum of 18" (45.7 cm).

3.07 CAP SHEET

A. For slopes less than 1/2" per foot (4.2 cm per meter), Type III or IV asphalt may be used. Type IV must be used on all slopes 1/2" per foot (4.2 cm per meter) and over. Asphalt shall be applied at its EVT temperature or 425°F (218°C), whichever is greater, in a uniform layer, without voids, at a rate of 25 lb/square (1.2 kg/m2) ±20%. See Article 3.04 "Bitumen". The mopping stroke will be such that the side lap is covered with asphalt last. A rolling bank (puddle) of mopping asphalt must be maintained across the full width of the roll.

B. Cap sheet application: Install full width cap sheets, lapping 4" (10.2 cm) on the sides and 6" (15.2 cm) on ends. Stagger adjacent end laps a minimum of 18" (45.7 cm) apart. All side and end laps must be staggered from underlying plies.

C. All laps must be parallel or perpendicular to the slope of the roof such that the flow of water is never against the lap.

D. SBS membranes must not be applied during adverse weather or without precautionary measures in temperatures below 45°F (7.2°C). Contact GAFMC Contractor Services for details.

E. Coiled rolls should be unrolled, placed upside down and allowed to "relax" prior to installation. Then re-roll to apply.

F. Care should be taken to insure that the cap sheet lays flat in the asphalt. There must be complete adhesion between the cap sheet and the mopping asphalt. Brooming of the plies may be necessary under certain conditions to insure that the cap sheet adheres solidly to the asphalt. Apply extra pressure to avoid creating open channels, where three or more membranes are lapped.

G. A minimum 3/8" (10 mm) asphalt flow-out must be obtained at all laps. Dry laps are not acceptable. Check all seams for full and uniform adhesion.

H. All end laps must be staggered a minimum of 18" (45.7 cm) so that no adjacent end laps coincide. If end laps fall in line or are not staggered the proper distance, a full width of Mop SBS membrane must be installed over the end laps.

I. If damage by other trades or any inadvertent damage should occur to the top cap product during installation, and for aesthetic purposes only, an additional fog coating can be applied to the sheet at a rate of ½ to 1 gallon per 100 sq ft.

3.08 BITUMINOUS BASE FLASHINGS

A. Install base flashing over all cant strips, horizontal to vertical transitions, roof edges and roof penetrations. Flashings are to be secured in accordance with current GAFMC application guidelines.

B. Nailable curbs and walls must be covered with a layer of approved GAFGLAS Base Sheet or backer ply fastened 8" (20.3 cm) o.c. in all directions with approved fasteners. All vertical laps shall be 4" (10.2 cm). Base sheet or backer ply must extend out onto the field of the roof as shown in the applicable GAFMC construction detail.

C. Prime all metal and masonry surfaces with asphalt primer, and allow adequate drying time prior to adhering flashing plies.

D. Backer plies installed over masonry or other non-nailable substrates must be cut into manageable lengths to ensure adequate adhesion to the cant strip and vertical surfaces without excessive voids. All vertical laps shall be 4" (10.2 cm). Backer plies shall extend onto the field of the roof as shown in the applicable GAFMC construction detail.

E. The finished ply of base flashing shall be run vertically to provide a selvage edge that will aid in achieving proper adhesion at the 3" (7.6 cm) vertical laps. If the sheet is run horizontally, the vertical laps must be a minimum of 6" (15.2 cm) and the selvage edge must be removed form the sheet or fully covered by the counterflashing. The finished flashing ply must extend out onto the field of the roof as shown in the applicable GAFMC construction detail, and must be extended a minimum of 4" (10.2 cm) beyond the edge of the prior flashing plies. The flashing must be soundly adhered to the parapet, cant area and roof surface to result in a minimum void, non-bridging construction.

F. Base flashing heights must be a minimum of 8" (20.3 cm) and a maximum of 24" (61.0 cm) above the roofline.

G. Use only Type IV hot asphalt. Maintain asphalt at the Equiviscous Temperature (EVT) +/- 25°F (13.9°C) for all base and ply sheets used in flashing details. Apply flashing membranes at the EVT temperature or 425°F (218°C) whichever is greater. Firmly press sheets into the adhesive, and immediately nail the top of the flashing as specified in the appropriate flashing detail.

H. Corner membrane flashings, such as "bow ties" for outside corners and "footballs" for inside corners or other membrane reinforcements are required to ensure that base flashing corners are sealed at cant areas. An alternate method of corner reinforcing is to install a smooth MB membrane reinforcement piece on the prepared corner substrate prior to final surfacing membrane.

3.09 PENETRATIONS

A. Horizontal penetrations shall be flashed with M-Curbs filled with M-Thane sealant, then coated with a topcoat.

B. Vertical penetrations shall be flashed with a topcoat fabric embedded between two coats of topcoat.

3.10 SHEET METAL

A. Metal should not be used as a component of base flashing. Because of the high coefficient of expansion of sheet metals and the large temperature changes that can be experienced on a roof, sheet metal or exposed metal components must be isolated from the waterproofing components of the roofing and flashing system as efficiently as possible to prevent the metal from splitting the membranes. Owner assumes no responsibility for damage to the roofing system caused by the movement of accessory metal.

B. When it is unavoidable to use metal in the roofing system (i.e., lead flange at drains, gravel stops), treated wood nailers and insulation stops, 1" (25 mm) wider than the metal flange, should be provided for metal flange attachment. Metal flanges must always be set on top of the roof membrane with modified trowel grade cold adhesive applied material for SBS roof systems. The metal flange is then sealed using the applicable construction detail to meet applicable guarantee requirements. Metal accessories (gravel stops, counter flashing, etc.) should be 16 oz. (0.56 mm) copper, 24 gauge (0.71 mm) galvanized or stainless steel, 2 1/2 to 4 lb (1.1-1.8 kg) lead, or 0.032" (0.81 mm) aluminum.

C. Fabricate and install all sheet metal materials as shown in applicable construction details. Refer to SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.) for guidance on sheet metal treatments not addressed in this specification.

D. Clean metal and apply asphalt primer to all sheet metal surfaces that will come into contact with asphalt or other bituminous materials; allow the primer adequate time to dry.

E. Use fastener types compatible with the sheet metal type.
   1. Copper or lead-coated copper: use copper or bronze fasteners.
   2. Lead and galvanized steel: use galvanized or cadmium-plated sheet fasteners.
   3. Aluminum: use aluminum fasteners.
   4. Stainless steel: use stainless steel fasteners.

F. Metal counter-flashing shall have a minimum 4" (10.2 cm) face with a drip lip. The bottom edge of the counterflashing shall cover the roofing membrane and/or base flashing by a minimum of 4" (10.2 cm). Metal counter flashing used for masonry walls, wooden walls, or through wall metal flashings should be a two piece design to allow for installation and later removal. Metal counter-flashings for stucco, EIFS, wood siding or similar materials should be designed appropriately, such as "Z" type flashing. End joints shall be lapped 3" (7.6 cm) or more. Adequate fasteners must be provided to secure against wind forces. Skirt fasteners shall be watertight.

G. Metal termination bars shall be a minimum of 1/10" (3 mm) thick x 1" (25 mm) wide with preformed sealant edge lap. Bar should have 1/4" (6 mm) x 3/8" (10 mm) slotted holes on 4" (10.2 cm) centers to facilitate mechanical anchorage.
   Note: Termination bars are not suitable in all base flashing and wall flashing conditions. Termination bars may only be used in conjunction with an appropriate counter-flashing extending a minimum of 4" (10.2 cm) below the termination bar.

H. Metal flanges for gravel stops, eave strips, and pitch pockets to be used in conjunction with roofing shall be primed (both sides), set in modified trowel grade cold adhesive applied material for SBS roof systems. Flanges shall be a minimum of 3 1/2" (8.9 cm) wide for gravel stops or eave strips and 4" (10.2 cm) wide for projections and extensions through the roof. The gravel stop lip should be at least 3/4" (19 mm) high. Eave strip lips shall be at least 3/8" (10 mm) high. Provisions must be made for securing the skirt to the face of the wall. This may be a wood nailer strip for masonry and metal construction. In all cases, gravel stop and

eave strip nailer should be fastened to the deck or deck system with adequate resistance against wind forces.

I. Stacks shall have metal sleeve flashing a minimum of 8" (20.3 cm) high. Pitch pockets for brackets, supports, pad-eyes, etc., shall have a 4" (10.2 cm) minimum height metal sleeve.

J. On re-roofing projects, provisions shall be made for reinstallation of existing sheet metal duct work, equipment, coping metal and counter-flashing removed in conjunction with the new work. Also, provide for cleaning and repairing of existing defective sheet metal, and replacement of missing and irreparable sheet metal to match existing types. Light gauge sheet metal flashings which are incorporated into roof system are not suitable for re-use and must be replaced with new material.

K. Conduits and piping such as electrical and gas lines must be set on wood blocking or some other form of support. Wood blocking/supports must be set on pads constructed of an additional layer of roof membrane material.

3.11 WALKWAYS

A. Walkways for normal rooftop traffic may be constructed from two plies of modified bituminous membrane of the same type as the field of the roof. This type of walkway is not for sidewalk or patio-type use.

B. Construct walkways by solidly adhering a first ply of smooth surfaced membrane to the field of the roof followed by a granule surfaced membrane to the surface of the first ply.

C. Walkway sections should be no longer than 10' (3 m), with a 6" (15.2 cm) minimum gap between each section to allow for drainage.

3.12 ROOF PROTECTION

A. Protect all partially and fully completed roofing work from other trades until completion.

B. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.

C. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.

D. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

3.13 CLEAN-UP

A. All work areas are to be kept clean, clear and free of debris at all times.

B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.

C. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.

D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.

E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.

F. Clean and restore all damaged surfaces to their original condition.

END OF SECTION

SECTION 07625 – FLASHING AND SHEET METAL

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Metal flashing and trim

B. Conductor heads and downspouts

C. Miscellaneous sheet metalwork

1.02 RELATED SECTIONS

A. 07410 – Metal Roofing: metal roofing, including related flashings and special shapes.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
2. ASTM A653/A653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or A653M Zinc-iron Alloy Coated (Galvannealed) by the Hot-Dip Process
3. ASTM A924/A924M Specifications for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
4. ASTM B29 Specification for Refined Lead
5. ASTM B32 Specification for Solder Metal
6. ASTM B209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate
7. ASTM B370 Specification for Copper Sheet and Strip for Building

B. Federal Specification (FS):

1. FS TT-S-230 Sealing Compound: Elastomeric Type, Single Component (For Calking, Sealing, and Glazing in Buildings and Other Structures)
2. FS TT-S-1543 Sealing Compound: Silicone Rubber Base (For Calking, Sealing and Glazing in Buildings and Other Structures)
3. FS UU-B-790 Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellent and Fire Resistant)

C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): SMACNA Architectural Sheet Metal Manual

1.04 SUBMITTALS

A. General: Refer to Section 01300 – Administrative Requirements, for submittal requirements and procedures.

B. Shop Drawings and Product Data: Submit detailed Shop Drawings of metal flashing and sheet metalwork, including conductor heads and downspouts, and installation details. Include manufacturers' product data for materials and manufactured items.

1.05 QUALITY ASSURANCE

A. Flashing and sheet metalwork shall be fabricated and installed in accordance with SMACNA Architectural Sheet Metal Manual.

B. Except where otherwise indicated, comply with minimum thickness or gage requirements as specified in SMACNA Architectural Sheet Metal Manual.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Galvanized Sheet Metal: Standard galvanized steel sheet, meeting requirements of ASTM A653/A653M and ASTM A924/A924M, as applicable, with minimum zinc coating of 1.25 ounces per square foot and 0.2 percent copper bearing, and mill phosphatized for maximum paint adherence. Where sheet metal gage is not indicated, provide 24 gage.

B. Stainless Steel: Stainless steel sheet for architectural applications, meeting the requirements of ASTM A167, Type 304 or Type 316, with No. 4 finish. Where stainless steel sheet gage is not indicated, provide 26 gage.

C. Aluminum Sheet Metal: ASTM B209, 5005 or 3003-H14 aluminum alloy as appropriate, clear anodized. Where aluminum sheet thickness is not indicated, provide 0.0201 inch thickness.

D. Building Paper: Rosin sized, unsaturated paper, weighing approximately 6 pounds per 100 square feet, or a water-repellent smooth building paper meeting requirements of FS UU-B-790, Type I, Grade A.

E. Fasteners and Accessories: Furnish anchors and fasteners, washers, straps, and accessories required for a complete and finished installation. Fasteners and accessories shall conform with the following requirements:

1. Nails shall be stainless steel, hard copper, bronze, or brass. Where sheet metal is built in over roofing materials or other sheet metal, use nails or screws with 1 inch matching nonferrous washers. Screws shall be standard stainless steel, brass, or bronze wood screws, as required. Sheet metal screws shall be self-drilling, self-tapping stainless steel or tempered non-corrodible steel of proper size and length to suit conditions.
2. Screw heads shall be furnished with neoprene washers.

3. Straps: Straps and miscellaneous fastenings, where required, shall be stainless steel, halfhard copper, or half-hard 70-30 brass of size indicated or required. Where not indicated, provide straps of 1/16 inch thick by 1 inch wide size.

I. Sealant: Compound shall be a urethane elastomeric sealant which cures at normal temperature to a flexible firm state, tack free, in gun grade consistency. Sealant shall be specifically recommended for adhesion to the surfaces to which it will be applied, and shall meet or exceed the minimum requirements of FS TT-S-230 or FS TT-S-1543, as applicable.

J. Isolating Material: Alkali-resistant bituminous paint or varnish.

2.02 FABRICATION AND SHOP PAINTING

A. Form and fabricate sheet metalwork as indicated and in accordance with the approved Shop Drawings and SMACNA Architectural Sheet Metal Manual. Properly reinforce sheet metalwork as required for strength and appearance.

B. Galvanized sheet metal surfaces which will be concealed in the finished work shall be chemically treated or etched to assure maximum paint adherence and then shop painted with one coat of primer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation Standards: Install flashing and sheet metalwork as indicated and in accordance with the approved Shop Drawings and SMACNA Architectural Sheet Metal Manual.

B. Flashing and Metal Trim: Provide flashing, counterflashing, cap flashing, metal trim, and any other fabricated items and miscellaneous sheet metalwork indicated or required to provide a complete and watertight installation.

C. Gutters and Downspouts: Install gutters and downspouts as indicated and in accordance with the approved Shop Drawings and pertinent provisions of SMACNA Architectural Sheet Metal Manual.

D. Work Quality:

1. Sheet metalwork shall be finished straight and true, with miters and joints accurately fitted. Exposed work shall be free of dents and other defects. Corners shall be reinforced and seams made waterproof. Edges of sheet metal shall be hemmed.
2. Provide for expansion and contraction in sheet metal assembly by means of expansion joints or other appropriate methods of SMACNA Architectural Sheet Metal Manual. Provide reinforcement as required.
3. Isolate and protect dissimilar metals from contact with each other by applying specified isolation material to contact surfaces. Protect surfaces of sheet metal in contact with concrete, treated wood, or aluminum with a heavy coating of bituminous paint.

4. Provide waterproof neoprene washers wherever required fasteners penetrate sheet metal. Exposed fasteners will not be permitted for any portion of this work.

E. Sealing: Seal joints and laps of sheet metalwork as indicated or required for a waterproof installation. Beads of sealant which will be concealed in the finished work shall be continuous with no voids of material.

END OF SECTION

SECTION 07710 – SELF- ADHERING ROOF UNDERLAYMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. Includes self-adhering, waterproof, rubberized roof underlayment for use under standing seam metal roofs.

1.02 QUALITY ASSURANCE

A. ASTM: D-1970, ICBO 4941.

B. Manufacturer's written installation instructions shall be available on the jobsite at all times work of this section is underway.

1.03 SUBMITTALS

A. Manufacturer's literature describing material and installation instructions.

PART 2 – PRODUCTS

2.01 ROOF UNDERLAYMENT

A. 40 Mil, self-adhering, rubberized polyethylene plastic waterproof roof underlayment (Tamko Moisture Guard, Grace Ice and Water Shield, or similar).

PART 3 – EXECUTION

3.01 INSTALLATION

A. Remove any dust, dirt, debris from deck. Thoroughly sweep deck.

B. Apply only to dry, clean surface at temperatures above 40 degrees F.

C. Decks shall have no voids or unsupported areas exceeding manufacturer's written installation instructions.

D. Apply ice and water shield over entire roof in shingle fashion from low to high point on the roof. Overlap edges 3-1/2" minimum and overlap ends 6" minimum.

E. Peel back release paper 1-2 feet. Align the membrane on the lower edge of the roof and adhere the first 1-2 feet. Pull the release paper from under the membrane and continue to peel it from the membrane while pressing the membrane into place. Roll lower edges firmly into place.

F. At valley and ridges, cut membrane into 4 to 6 foot lengths. Peel the release paper and center the sheet over the valley or ridge. Drape and press the sheet into place. For valleys, apply the membrane starting at the lowest point and working upward. Overlap sheets 6" minimum. Apply valley membranes first.

G. Do not install where permanent exposure to weather will occur. Avoid temporary exposure for longer than 5 days.

H. Membrane may be folded onto the fascia provided a metal edge, or other material will cover it.

I. Overlay with permanent roofing material. Apply metal drip edges and terminations over ice and water shield. Surfacing materials shall be placed at temperatures of 40 degrees F or higher.

END OF SECTION

SECTION 07900 – JOINT SEALANTS

PART 1 – GENERAL

1.01 Description of Work

RELATED DOCUMENTS

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

B. The work under this section of the specifications includes all labor, materials, equipment, and services necessary to complete the sealant work as shown on the drawings and herein specified.

C. Such sealants/caulking will normally be performed under the work of various sections of the specifications, but shall be performed in strict accordance with the provisions of this section.

D. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 4 Section "Unit Masonry"
2. Division 7 Section "Flashing and Sheet Metal" for sealing joints related to flashing and sheet metal for roofing.
3. Division 8 "Glass and Glazing" for sealants used in glazing.
4. Division 9 Section "Tile" for sealing tile joints.

1.02 Definitions

A. Sealant/sealing shall apply to the filling or closing of interior or exterior joints where expansion or contraction is expected and making joints watertight is the main consideration. Typical would be behind edge metal fabrications at membrane terminations, at removed or installed fasteners, and around perimeters of mechanical penetrations, protrusions through masonry or concrete. Typical interior joints would be control joints and mechanical penetrations.

B. Caulk/caulking shall apply to the filling or closing of interior joints where expansion or contraction is minor and appearance is the main consideration. Typical would be metal frames.

1.03 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.

1.04 Submittals

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

1. Product data from manufacturers each joint sealant product required.
2. Certificates from manufacturers of joint sealants attesting that their products comply with specifications requirements and are suitable for the use indicated.

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

B. Before delivery to the job, submit samples of caulking and sealing compound for approval by Architect.

1.05 Quality Assurance

A. Use only qualified workmen thoroughly skilled and specially trained in the techniques of caulking, who can demonstrate to the satisfaction of the Architect their ability to fill joints solidly and neatly.

B. Mixing and application of sealing compound shall be in strict accordance with the manufacturer's printed directions. Initial mixing and application shall be under the direct supervision of the manufacturer's representative.

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

D. Product Testing: Provide comprehensive test data for each type of joint sealant based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to Architect.

1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.

1.06 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 multicomponent materials.

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

C. Protect caulking materials before, during and after installation. Protect the installed work of other trades during installation.

D. Do not use caulking materials that have been stored for a period of time exceeding the maximum recommended shelf life of the materials.

1.07 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.

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.

PART 2 - PRODUCTS

2.01 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 applications, 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.

2.02 - Materials

A. Urethanes

C. Accessories: Backing rod, primer, bond breaker tape and other items essential to the completeness of the installation shall be provided and installed as recommended by the manufacturer.

D. Storage: Store all sealants and accessories under conditions to prevent contamination of sealants and accessories.

2.03 - Sealant Types

A. Urethanes: Use urethanes only by Sonneborn, Sika, or approved equal.

2.04 - Materials Performance Requirements

A. Colors: as selected by Architect from manufacturer's standard color chart.

B. Sealant Primer: Suitable to substrate surfaces as recommended by the sealant manufacturer. Knowledge of whether the primer is staining or non-staining should be obtained prior to application.

C. Joint Backing: Preformed compressible, resilient, non-waxing, non-extruding, non-staining strips (polyethylene foam or urethane foam) as recommended by the sealant manufacturer. Backing shall be of sizes and shapes to suit the various conditions, and shall be compatible with sealant, primers, and substrates.

D. Bond Breaker and Cleaning Agents: As recommended by sealant manufacturer.

PART 3 - EXECUTION

3.01 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.

3.02 Installation

A. Surface cleaning of joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer 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 Size: Refer to construction drawings for joint sizes and locations which are based on building movement, sealant capabilities and substrate requirements.

3.03 Preparation of Surfaces

A. Primer: Thoroughly clean joints and apply primer, if recommended by sealant manufacturer, to dry surfaces. Apply primer prior to application of joint backing, bond breaker, or sealants.

B. Joint Backing: In joints where the depth of the joint exceeds the required depth of the sealant, install joint backing to provide backing and uniform depth of sealant. Joint backing shall be installed with approximately 30% compression. Do not stretch, twist, puncture, or tear joint backing. Butt joint backing at intersections.

C. Bond Breaker Tape: Install bond breaker tape smoothly at back of joint where joint backing is not required or cannot be installed (sealant shall adhere only to the sides and not to the back of the joint so as to eliminate three sided adhesion).

3.04 Installation

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 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Sealant Application: Apply sealant in accordance with manufacturer's application manual and instruction, using hand guns or pressure equipment, with proper nozzle size, on clean, dry, properly prepared substrates. Force sealant into joint and against sides of joint to make uniform. Avoid pulling of the sealant from the sides. Fill sealant space completely with sealant.

D. Tooling: Tooling is required to ensure firm full contact with the interfaces of the joint. Tool joints to form smooth, uniform beads with slightly concave surfaces. Finish joints shall be straight, uniform, smooth and neatly finished. Remove any excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition. Tooling agents should only be used if recommended by the sealant manufacturer.

E. Where an irregular surface or sensitive joint border exists the applicator shall apply masking tape at the edge of the joint to ensure joint neatness and protection. Tape to be removed after sealant is applied.

F. Exposed sealant/caulking shall be free of wrinkles, air pockets, foreign matter, and be

uniformly smooth.

G. Before using sealant, ensure its compatibility with joint surface, fillers and other materials in joint system. Provide only materials compatible with installation conditions.

H. Adjacent surfaces of caulking installation shall be cleaned of smears, soiling, staining, or over-caulking.

I. Rejection of installed sealants and caulking:

1. Any caulking or sealant found to be "lifting" or not adhering properly shall be totally removed, re-primed, and replaced. Caulking over previously installed caulking will not be allowed.

2. Indication of lack of skill on the part of caulking installers shall be sufficient grounds for the Architect to reject installed caulking and to require its immediate removal and complete re-caulking at no additional cost to Owner.

3.05 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.

3.06 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 the original work.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel doors

1.02 RELATED SECTIONS

A. Door Hardware on drawings

B. Section 08115 – Door Frames.

1.03 REFERENCES

A. ANSI A250.8 – SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 1998.

B. DHI A115.1G – Installation Guide for Doors and Hardware; 1994.

C. ASTM A 653/A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1999a.

D. NFPA 80 – Standard for Fire Doors and Fire Windows; 1999.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog data for specified products demonstrating compliance with referenced standards.

B. Shop Drawings: Show layout, profiles, product components, hardware, anchorages, accessories, and finish colors.
   1. Include schedule identifying each unit, with door marks or numbers referencing drawings.

C. Certificates: Product certificates signed by the manufacturer certifying material compliance with ANSI A250.8, specified performance characteristics and criteria, and physical requirements.

D. Installation Instructions: Manufacturer's printed installation instructions.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

1. Certificate: When requested, submit certificate indicating qualification.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Manufacturer's original, unopened, undamaged containers, identification labels intact.
   2. Handle and store products according to manufacturer's recommendations published in technical materials. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.

B. Storage and Protection:
   1. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
   2. Store doors protected at corners to prevent damage or marring of finish. Store doors in upright position under cover on building site on wood sills or on floors in a manner to prevent rust and damage.
   3. Store frames in upright position under cover on building site on wood sills or on floors in a manner to prevent rust and damage.
   4. Do not use non-vented plastic or canvas shelters.

1.07 PROJECT CONDITIONS

A. Verify actual openings by field measurements before fabrication; show recorded measurements on shop drawings.

B. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.08 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

PART 2 PRODUCTS

2.01 DOORS AND PANELS

A. Fabricate from two sheets of steel with no visible seams on either face or vertical edges; continuously weld door edges and fill and grind smooth.

B. Hardware Locations: Unless otherwise specified, conform to recommendations of Steel Door Institute or Door and Hardware Institute for location of locks, hinges, latches, push-pull plates and bars, exit devices, handle sets, closer reinforcings, roller latches, and arm pulls.

C. Securely projection weld face panels to 16 gage steel channel end closures around entire

perimeter, 2 inches on center, and securely bond with thermosetting adhesive to Supercore(r), nominal 1 pound per cubic foot density, odorless, rigid foam, resistant to fungus, bacteria, moisture, mildew, and rot.

2.02 FINISHES

A. Primer: Finish exposed surfaces of doors and frames.

B. Factory Finish paint where indicated: Chemically clean and treat. Provide heavy coat of electrostatically-applied baked on finish paint providing good resistance in mar and abrasion tests, weather and chemical resistant. See finishes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installation of doors and frames in accordance with manufacturer's installation instructions and technical bulletins.
   1. Verify door frame openings are installed plumb, true, and level.
   2. Select fasteners of adequate type, number, and quality to perform intended functions.

3.02 INSTALLATION

A. General:
   1. Set frames plumb, square, aligned, without twist at correct elevation.
   2. Comply with Steel Door Institute (SDI) installation and maintenance standards.

B. Secure anchorages and connections to adjacent construction.

C. Install doors and hardware in accordance with manufacturers' templates and instructions.

D. Finish exposed field welds to present a smooth uniform surface; touch-up with rust inhibitive primer.

E. Touch-up exposed surfaces scratched or marred during shipment, installation, or handling and field prime scratches or bare edges with a rust inhibitive primer.

F. Before application of finish paint coat, ensure that surfaces are dry and free of dirt, oil, and dust.

G. Apply finish coat over intact film, complying with application instructions of finish coat manufacturer.

H. Install glazing materials and silencers.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for verification of product installation in accordance with manufacturer's instructions.

3.04 ADJUSTING AND CLEANING

A. Adjust hinge sets, locksets, and other hardware. Lubricate using a suitable lubricant compatible with door and frame coatings.

B. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions before owner's acceptance.

C. Remove from project site and legally dispose of construction debris associated with this work.

3.05 PROTECTION

A. Protect installed products and finished surfaces from damage during construction.

END OF SECTION

SECTION 08115 – STEEL DOOR FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated steel frames.

1.02 RELATED SECTIONS

A. Section 08710 – Door Hardware: Hardware and weatherstripping.

1.03 REFERENCES

A. ANSI/ICC A117.1 – American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.

B. ANSI A250.3 – Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames; 1993.

C. DHI A115 Series – Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition (ANSI/DHI A115 Series).

1.04 SUBMITTALS

A. See Section 01300 – Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Samples: Submit two sample of frame metal, 2 x 2 inches in size showing factory finishes, colors, and surface textures.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Frames:
   1. Ceco Door Products
   2. Republic Builders Products
   3. Steelcraft Manufacturing Co.

2.02 STEEL DOOR FRAMES

A. Requirements for All Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Glazed Lights: Where applicable, non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   3. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   4. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), with manufacturer's standard coating thickness.
   5. Finish: Factory primed, for field finishing.
   6. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.
   7. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
   8. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
   9. Steel door provided must meet the desired 160MPH wind load design. See structural drawing for all wind pressures.

B. Exterior Door Frames: Face welded, seamless with joints filled.
   1. Grade: Comply with frame requirements specified in ANSI A250.8 for Level 1, 18 gage
   2. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed), with manufacturer's standard coating thickness.
   3. Weatherstripping: Separate, see Section 08710.

C. Interior Door Frames: Knock-down type.
   1. Grade: Comply with frame requirements specified in ANSI A250.8 for Level 1, 18 gage
   2. Terminated Stops: Provide at all interior doors; closed end stop terminated 6 inches above

floor at 45 degree angle.

E. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.

2.03 ACCESSORY MATERIALS

A. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners corners;; prepared for countersink style tamper proof screws.

C. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

D. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.04 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

B. Factory Finish: Complying with ANSI A 250.3, manufacturer's standard coating of color as selected.

C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Coordinate installation of glazing.

F. Coordinate installation of hardware.

G. Coordinate installation of electrical connections to electrical hardware items.

3.04 ERECTION TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI A250.8.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

END OF SECTION

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Solid core doors with wood veneer faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.

C. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.

1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.

D. Samples for initial selection in the form of color charts consisting of actual materials in small sections for the following:

1. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

A. Quality Standard: Comply with the following standard:

1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.

B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.6 PROJECT CONDITIONS

A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with the following requirements applicable to Project's geographical location:

1. AWI quality standard Section 100-S-11 "Relative Humidity and Moisture Content."

1.7 WARRANTY

A. General Warranty: Door manufacturer's 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. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall be in effect during the following period of time after date of Substantial Completion.

a. Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors that may be incorporated in the Work include, but are not limited to, the following:

1. Solid Core Doors:

a. Algoma Hardwoods Inc.
b. Fenestra Corporation.
c. Graham Manufacturing Corp.
d. Haley Brothers, Inc.
e. IPIK Door Co., Inc.
f. Marlite.
g. Mohawk Flush Doors, Inc.
h. Weyerhauser Co.

2.2 INTERIOR FLUSH WOOD DOORS

A. Solid Core Doors Finish: Comply with the following requirements:

1. Faces: Any closed-grain hardwood of mill option.
2. Grade: Economy.
3. Construction: 7 plies.
4. Core: Particleboard core.
5. Core: Nonglued-block core.
6. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.

2.3 FABRICATION

A. Fabricate flush wood doors to comply with following requirements:

6. In sizes indicated for job-site fitting.
7. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels:

   d. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-resistance-rated doors.

8. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.

   d. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.

B. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2.4 SHOP PRIMING

A. Transparent Finish: Shop-seal faces and edges of doors for transparent finish with stain (if required), other required pretreatments, and first coat of finish as specified in the following:

1. Division 9 Section "Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installed door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation see Division 8 Section "Door Hardware."

B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.

C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch (3.2 mm) at jambs and heads, 1/16 inch (1.6 mm) per leaf at meeting stiles for pairs of doors, and 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch (6.4-mm) clearance from bottom of door to top of threshold.
2. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
3. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.

D. Field-Finished Doors: Refer to the following for finishing requirements:

1. Division 9 Section "Painting."

3.3 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 08433 ALUMINUM FRAMED STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

1. Types of Aluminum Storefront Systems include:

a. Thermal Storefront System - 2" x 4-1/2" (50.8 x 114.3) nominal dimension; Thermal; Center

B. Related Sections:

1. Division 08440 "Glazed Aluminum Curtain Walls"
2. Division 08800 "Glazing"

1.02 REFERENCES (INDUSTRY STANDARDS)

1.03 SYSTEM DESCRIPTION

A. Storefront System Performance Requirements:

1. Wind loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures according to the structural engineers drawings.
2. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft2 (0.3 l/s · m2) at a static air pressure differential of 6.24 psf (300 Pa).
3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.
4. Uniform Load: A static air design load of 20 psf (958 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
5. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:

a. Glass to Center - 0.44 (low-e) or 0.61 (clear).

6. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:

a. Glass to Center - 62 $_{frame}$ and 68$_{glass}$ (low-e).

7. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC): When tested to AAMA Specification 1801 and in accordance with ASTM E1425 and ASTM E90, the STC and OITC Rating shall not be less than:

a. Glass to Center - 37 (STC) and 30 (OITC)

1.04 SUBMITTALS

A. General: Prepare, review, approve, and submit specified submittals in accordance with "Conditions of the Contract" and Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in "Conditions of the Contract."

B. Quality Assurance/Control Submittals:

1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.

1.05 WARRANTY

A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.

B. Manufacturer's Product Warranty: Submit, for Owner's acceptance, manufacturer's warranty for storefront system as follows:

1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by MFG.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
2. Manufacturer Qualifications: Manufacturer capable of providing structural calculations, applicable independent product test reports, installation instructions, a review of the application method, customer approval and periodic field service representation during construction.

B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS (ACCEPTABLE MANUFACTURERS/PRODUCTS)

A. Acceptable Manufacturers: Kawneer Company, Inc.

1. Kawneer Company, Inc.
2. Amarlite Architectural Products
3. EFCO Corporation; Monett
4. Southwest Aluminum Systems, Inc.

5. Tubelite Division of Indal, Inc.
6. U.S. Aluminum Corporation
7. Vistawall Architectural Products,

2. Proprietary Product(s)/System(s): Aluminum Storefront Systems.
   a. Aluminum Storefront System
   b. Series: Thermal Storefront System
   c. Framing Member Profile: 2" x 4-1/2" (50.8 x 114.3) nominal dimension; Center
   d. Finish/Color: (See 2.06 Finishes)

2.02 MATERIALS

A. Aluminum (Framing and Components):
   1. Material Standard: ASTM B 221; 6063-T6 alloy and temper
   2. Member Wall Thickness: Each framing member shall provide structural strength to meet specified performance requirements.
   3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.03 ACCESSORIES

A. Fasteners: Where exposed, shall be Stainless Steel.
B. Gaskets: Glazing gaskets shall be extruded EPDM rubber.
C. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
D. Thermal Barrier:
   1. Thermal Break with a 1/4" (6.4) separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
      a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.
E. SunShade: An aluminum sunshade (consisting of outriggers, louvers, and fascia which may be selected from standard configurations), that is anchored directly to the vertical mullions. Outriggers shall be painted (Select from MFG standard paints and colors.) Louvers and fascia shall be anodized.
F. InLighten™ (light shelf): aluminum light shelf system consisting of anchor channels, support beams, fascia trims and Aluminum Composite Material (ACM) panels that is anchored directly to the Curtain Wall intermediate horizontal members.
   1. Light shelf location shall be as detailed on the architectural drawings. Specifier to choose light shelf end treatment as described below:
      a. “Wall to Wall” light shelf end treatment; recommended for wall to wall applications (with open-end assembly) or
      b. “End Caps” light shelf end treatment; recommended for punched opening applications (with closed-end assembly). Specifier to choose light shelf model as described below:
   2. Standard designs shall be “Fascia Cap” or “Continuous Panel” models.

a. Fascia Cap model: Consists of top and bottom ACM panel surfaces with separate interior extruded aluminum fascia trim as selected from standard profiles, (custom profiles are available on request).

b. Continuous Panel model: Consists of a single ACM panel formed to create the overall shelf profile.

3. Light shelf assembly dimensions shall be as follows:
   a. Overall light shelf assembly nominal thickness shall be 2-1/2" (63.5)
   b. Overall projection depth shall be as detailed on the architectural drawings, maximum depth is 30" (762).
   c. ACM panels shall be 3mm or 4mm thick.
4. Anchor channels and fascia trims shall be anodized.
   a. Select from MFG standard anodized finishes.
5. Aluminum Composite Material (ACM) panels shall be painted.
   a. Top panel of Fascia Cap model and Continuous Panel model shall be painted white.
   b. Bottom panel of Fascia Cap model shall be painted as specified.
6. Panel Joint Trim for Fascia Cap model.
7. Select color for top and bottom trim: White.

2.04 RELATED MATERIALS

A. Sealants: Refer to Joint Treatment (Sealants) Section.

B. Glass: Refer to Glass and Glazing Section.

2.05 FABRICATION

A. General:
   1. Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
   2. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
   3. Prepare components to receive anchor devices. Fabricate anchors.
   4. Arrange fasteners and attachments to conceal from view.

2.06 FINISHES

A. Factory Finishing:
   1. Permanodic® AA-M12C22A44, AAMA 611, Architectural Class I Color Anodic Coating (Color: Medium Bronze).

2.07 SOURCE QUALITY CONTROL

A. Source Quality: Provide aluminum storefront specified herein from a single source.
   1. Building Enclosure System: When aluminum storefront is part of a building enclosure system, including entrances, entrance hardware, windows, curtain wall system and related products, provide building enclosure system products from a single source manufacturer.

B. Fabrication Tolerances: Fabricate aluminum storefront in accordance with framing manufacturer's prescribed tolerances.

PART 3 – EXECUTION

3.01 EXAMINATION

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

1. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.02 INSTALLATION

A. General: Install framing system in accordance with manufacturer's instructions and AAMA storefront and entrance guide specifications manual.

1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
2. Weathertight Construction: Install sill members and other members in a bed of sealant or with joint filler or gaskets, to provide weathertight construction. Coordinate installation with wall flashings and other components of construction.
3. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
4. Provide alignment attachments and shims to permanently fasten system to building structure.
5. Align assembly plumb and level, free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.

B. Related Products Installation Requirements:

1. Sealants (Perimeter): Refer to Joint Treatment (Sealants) Section.
2. Glass: Refer to Glass and Glazing Section.
   a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual.

3.03 FIELD QUALITY CONTROL

A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.

1. Testing: Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.

a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft^2, whichever is greater.

b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf (300 Pa).

B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

3.04 PROTECTION AND CLEANING

A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION

SECTION 08446 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Aluminum Entrances, glass and glazing, and door hardware and components.

1. Types of Aluminum Entrances include:

a. 190 Swing Door; Narrow stile, 2-1/8" (54) vertical face dimension, 1-3/4" (44.5) depth, moderate traffic applications.

B. Related Sections:

1. Division 08443 "Aluminum-Framed Storefronts"
2. Division 08440 "Glazed Aluminum Curtain Walls"
3. Division 08800 "Glazing"

1.02 REFERENCES (INDUSTRY STANDARDS)

1.03 SYSTEM DESCRIPTION

A. Entrance Performance Requirements:

1. Air Infiltration: For single acting offset pivot or butt hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 6.24 psf (300 Pa) for single doors and 1.567 psf for pairs of doors. A single 3'0" x 7'0" (915 x 2134) entrance door and frame shall not exceed 0.50 cfm per square foot. A pair of 6'0" x 7'0" (1830 x 2134) entrance doors and frame shall not exceed 1.0 cfm per square foot.
2. Structural: Corner strength shall be tested per the MFG dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner integrity [Testing procedure and certified test results available upon request].

1.04 SUBMITTALS

A. General: Prepare, review, approve, and submit specified submittals in accordance with "Conditions of the Contract" and Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in "Conditions of the Contract."

B. Quality Assurance/Control Submittals:

1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.

1.05 WARRANTY

A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.

B. Manufacturer's Product Warranty: Submit, for Owner's acceptance, manufacturer's warranty for entrance system as follows:

1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by MFG. In addition, welded door corner construction

shall be supported with a limited lifetime warranty for the life of the door under normal use.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
2. Manufacturer Qualifications: Manufacturer capable of providing structural calculations, applicable independent product test reports, installation instructions, a review of the application method, customer approval and periodic field service representation during construction.
3. On access control installations, all wiring to be coordinated with a licensed electrical installer.

B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.07 DELIVERY, STORAGE AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle entrance doors and components to avoid damage. Protect entrance doors against damage from elements, construction activities, and other hazards before, during and after entrance installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS (ACCEPTABLE MANUFACTURERS/PRODUCTS)

A. Acceptable Manufacturers:

1. Kawneer Company, Inc.
2. Amarlite Architectural Products
3. EFCO Corporation; Monett
4. Southwest Aluminum Systems, Inc.
5. Tubelite Division of Indal, Inc.
6. U.S. Aluminum Corporation
7. Vistawall Architectural Products,

2. Proprietary Product(s)/System(s): Aluminum Entrances.
   a. Series: Narrow StileSwing Doors
   b. Finish/Color: (See 2.06 Finishes)

2.02 MATERIALS

A. Aluminum (Entrances and Components):

1. Material Standard: ASTM B 221; 6063-T6 alloy and temper.
2. The door stile and rail face dimensions of the 190, entrance door will be as follows:

Door	Vertical Stile	Top Rail	Bottom Rail
190	2-1/8" (54)	2-1/4" (58)	3-7/8" (99)

3. Major portions of the door members to be 0.125" (3.2) nominal in thickness and glazing molding to be 0.05" (1.3) thick.
4. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by The Aluminum Association.

B. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.

C. Provide adjustable glass jacks to help center the glass in the door opening.

2.03 ACCESSORIES

A. Fasteners: Where exposed, shall be aluminum, stainless steel or plated steel.

B. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

C. Standard Entrance Hardware

1. Weatherstripping:

a. Meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.

b. The door weathering on a single acting offset pivot or butt hung door and frame. This is comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.

2. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners (Necessary to meet specified performance tests).
3. Threshold: Extruded aluminum, one piece per door opening, with ribbed surface.

2.04 RELATED MATERIALS

A. Sealants: Refer to Joint Treatment (Sealants) Section

B. Glass: Refer to Glass and Glazing Section

2.05 FABRICATION

A. Entrance System Fabrication:

1. Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8" (29) long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord.
2. Accurately fit and secure joints and corners. Make joints hairline in appearance.
3. Prepare components with internal reinforcement for door hardware.
4. Arrange fasteners and attachments to conceal from view.

2.06 FINISHES

A. Factory Finishing:

1. Permanodic® AA-M12C22A44, AAMA 611, Architectural Class I Color Anodic Coating (Color Medium Bronze).

2.07 SOURCE QUALITY CONTROL

A. Source Quality: Provide aluminum entrances specified herein from a single source.
   1. Building Enclosure System: When aluminum entrances are part of a building enclosure system, including storefront framing, windows, curtain wall system and related products, provide building enclosure system products from a single source manufacturer.

B. Fabrication Tolerances: Fabricate aluminum entrances in accordance with entrance manufacturer's prescribed tolerances.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive entrance system and sill plate is level in accordance with manufacturer's acceptable tolerances.
   1. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.02 INSTALLATION

A. General: Install entrance system in accordance with manufacturer's instructions and AAMA storefront and entrance guide specifications manual.
   1. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
   2. Provide alignment attachments and shims to permanently fasten system to building structure.
   3. Align assembly plumb and level, free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.
   4. Set thresholds in bed of mastic and secure.
   5. Adjusting: Adjust operating hardware for smooth operation.

B. Related Products Installation Requirements:
   1. Sealants (Perimeter): Refer to Joint Treatment (Sealants) Section.
   2. Glass: Refer to Glass and Glazing Section.
      a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual.

3.03 CLEANING AND PROTECTION

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

B. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum entrances from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants. Remove and replace damaged aluminum entrances at no extra cost.

END OF SECTION

I. PART ONE GENERAL

1.01 SUMMARY:

A. Work included: Furnishing and installing factory fabricated and finished automatic sliding door system(s).

B. Related Work: [Insert applicable sections including:].

1. Section 07900 – Caulking
2. Section 08400 – Entrances and Storefronts
3. Section 08710 – Finish Hardware
4. Section 08800 – Glazing
5. Section 12670 – Entrance Mats
6. Section 16120 – Electrical Supply and Termination

1.02 REFERENCES:

A. Underwriters Laboratories (UL), 333 Pfingsten Road, Northbrook, IL 60062, 847-272-8800, Fax: 847-272-8129.

B. American National Standards Institute (ANSI), 11 W. 42nd St., 13th Floor, New York, NY 10036, 212-642-4900, Fax: 212-398-0023.

C. Builders' Hardware Manufacturers Association (BHMA), 355 Lexington Ave., New York, NY 10017, 212-661-4261, Fax: 212-370-9047.

D. National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269, 800-344-3555, 617-770-3000, Fax: 617-984-7057.

E. Canadian Standards Association (CSA), 178 Rexdale Blvd., Rexdale, ON, Canada M9W 1R3, 416-747-4000, Fax: 416-747-4149.

F. Boca Evaluation Services, 4051 West Flossmoor Road, Country Club Hills, IL 60478, 708-799-2305, Fax: 708-799-0310.

G. ICBO Evaluation Services, 5360 Workman Mill Road, Whittier, CA 90601, 562-699-0543, Fax: 562-695-4694.

H. International Standards Organization (ISO).

1.03 SUBMITTALS:

A. Product Data: Provide manufacturer's product and complete installation data for all materials in this specification.

B. Shop drawings: Show profiles, joining method, location of components, anchorage details, adjacent construction interface, and dimensions as well as all necessary wiring and electrical requirements.

C. Samples: Sized to adequately represent material.

D. Contract Closeout: Submit the Manufacturer's warranty and performance certifications [if applicable].

E. Installation Guide: Provide a written installation guide and/or installation recommendations.

1.04 QUALITY ASSURANCE:

A. Automatic sliding door system shall be CERTIFIED by the manufacturer to meet performance design criteria according to the following test standards: [select, if applicable]:

1. ANSI A156.10.
2. NFPA 101.
3. Underwriter's Laboratories 325 (UL) listed.
4. C-UL Certified (equivalent to CSA certified).
5. ICBO (UBC Standard 10-1).
6. Boca (Boca Code Section 1017.4.3).
7. Clean Room (Federal Standard 209 E, Class I).

B. Automatic Sliding Door System: Shall be manufactured in an ISO 9001 registered manufacturing facility.

1.05 PRODUCT HANDLING:

A. All materials shall arrive in the manufacturer's original sealed, labeled containers.

B. Store materials in a dry, protected, well-vented area. Report damaged material immediately to the delivering carrier and note such damage on the carrier's freight bill of lading.

C. Remove all protective materials after installation.

1.06 SUBSTITUTIONS:

A. Proposals for substitution products will be accepted only from bidding contractors a minimum of 10 working days before the bid due date. The proposed substitution shall meet the performance and quality standards of this specification.

1.07 JOB CONDITIONS:

A. Verify that other trades are complete before installing the automatic sliding door system.

B. Mounting surfaces shall be plumb, straight and secure; substrates shall be of proper dimension and material.

C. Refer to the construction documents, shop drawings and manufacturer's installation instructions.

D. Coordinate installation with the glass, glazing and electrical work.

E. Observe all appropriate OSHA safety guidelines for this work.

1.08 WARRANTY/GUARANTEE:

A. Manufacturer's Standard Warranty: Warranted materials shall be free of defects in material and workmanship for one year after installation.

PART TWO PRODUCTS

2.01 MANUFACTURER:

A. Stanley Access Technologies

2.02 AUTOMATIC SLIDING DOOR SYSTEMS:

A. Automatic Sliding Door System: Shall be Stanley DURA-GLIDE Series 2000. The system shall consist of sliding aluminum door(s), sidelight(s) (unglazed), header, operator, and actuating controls. The system shall be completely engineered, manufactured and assembled by Stanley Access Technologies. All components shall be factory assembled in the header, adjusted and tested. No field wiring or operator adjustment shall be required other than the connection to job-site power and fine-tuning of door speeds to compensate for various door sizes and weights.

B. Sliding Aluminum Doors: Provide door units to dimension heights and widths with corresponding glazing as shown on construction documents [select one: standard narrow stile or medium stile]. Door holders shall be provided for all panels to control the door(s) as they swing in the direction of egress. All door panels shall have security glass stops. [Please specify as applies: Glass stops 1/4", 5/8" and 1" shall be available for all door panels and transom.] All doors shall have intermediate rails. The bi-part sliding door system shall include a two-point lock securing the lead edges of the door stiles together and to the hanger assembly. The active sliding door shall be provided with a key cylinder on the exterior and a thumb turn on the interior in accordance with NFPA 101.

C. Door Operation: Shall be [select one or more: single slide or bi-part] directional operation. In compliance with NFPA 101, the sliding door panel(s) shall allow "breakout" to the full open position to provide instant egress at any point in the door's movement. To allow safe egress, automatic operation shall be discontinued when the SX panel is in the "breakout" mode. Door(s) and sidelight(s) shall be sized to prevent pinch points at meeting stiles.

D. Aluminum Frame and Extrusions: Shall be a minimum .125" wall thickness in integral structural sections. The frame shall be [select one: standard 4-1/2" deep section or 6" deep section]. The bi-part transom packages shall contain one vertical transom tube. [Specify, if applicable: Provide additional vertical tubes].

E. Aluminum Extrusion Finish: Standard anodized finish shall be [select one: AA-M12-C22-A31 Clear, AA-M12-C22-A44 Dark Bronze or Black]. [Special and painted finishes are available upon request. Specify color finish].

F. Sidelights: [select one: fixed 'O' panel or 'P' panel] Provide sidelights to dimension heights and widths as shown on construction documents with corresponding glazing. All 'O' panels shall have intermediate rails.

G. Header Case: Shall be 6" wide by 8" high (152 mm wide by 203 mm high) extruded aluminum and capable of supporting bi-parting doors of 220 pounds per leaf over a span of 14'-0" with minimal deflection. It shall contain door operator and door mounting components. The header cover shall have a continuous self- locking hinge to open flush with the top of the header.

H. Door Hanger Wheels: Shall be 2-1/2" (64 mm) diameter urethane wheels with precision steel lifetime lubricated ball bearing centers. The sliding door(s) shall be held on the track by 2" (51 mm) diameter anti-riser wheels and supported by a factory adjusted cantilever support and pivot assembly. This assembly shall allow the sliding doors to swing outward for emergency egress without the need for a lower door pivot support. The door height shall have an adjustment of 1/8" +/- as required by field conditions.

I. Door Operator and Controller: Shall be the Stanley Dura-Glide System driven by an electro-mechanical operator and a regulated electronic controller. The operator components shall consist of a DC permanent magnet 1/8 horsepower motor, gear reduction drive, Stanley Pozi-Trac position encoder, and a microprocessor control box. Provide 120 VAC, 5 amps minimum to electrical door operator.

J. Microprocessor Control Box: Torque shall be factory set as prescribed by ANSI A156.10. The control box and Stanley Pozi-Trac position encoder shall automatically set the opening and closing check positions, and the full open and full closed position of the door system.

K. Threshold Sensor: Shall be the factory installed Stanley Stanguard™ Threshold Sensor. It shall be a self-contained fully adjustable sensor system that works in conjunction with Stanley SU-050 motion sensors. Simultaneously with the door opening signal, the sensor shall be energized. It shall emit a 30" deep by 72" maximum wide elliptical shaped infrared presence zone centered on the doorway threshold line. The door

shall close after the SU-050 sensor and Stanguardä threshold sensor detect a clear surveillance field.

L. Motion Sensor: Shall be the Stanley SU-050 Motion Sensor. The unit shall be switchable between bi-directional and uni-directional k-band frequency to detect all motion, fast or slow, in both directions with a relay hold time of 2-30 seconds. The Stanley SU-050 shall be mounted to the header 10'-0" maximum above the finish floor. Using the adjustable antenna the detection pattern shall be semi-circular, approximately 7'-0" wide by 5'-0" deep for a wide zone and approximately 6'-0" wide by 8'-0" deep for a narrow zone. The location of the detection zone shall be adjustable from the face of the door (20 degrees to 35 degrees in increments of 3 degrees). The unit shall operate between 30 degrees through 122 degrees F in all environmental conditions. The supply voltage shall be 12-24 V AC/DC +/- 10% and the power consumption shall be 6 W maximum.

M. Safety Search Circuitry: Shall be provided which will recycle the doors when an object is encountered during the closing cycle. The circuitry shall search for that object on the next closing cycle by reducing the door speed at the position the object was previously encountered, and will continue to close in check speed until the doors are fully closed, at which time the doors will reset to normal speed. If the obstruction is encountered again, the doors shall come to a full stop. The door shall remain stopped until the obstruction is removed and an operate signal is given, resetting the door to its normal speed.

N. Accessories: The Dura-Glide 2000 automatic sliding door system shall have the following accessories to reduce energy loss: Adjustable nylon sweep(s) on the bottom of the sliding door(s), double pile weatherstripping for the sliding door lead edges, single pile weatherstripping between the carrier and the header on the lead stile(s) of the sidelight(s) and the pivot stile(s) of the sliding door(s), and a selector switch located on the interior side of the unit to allow door(s) to open at full or reduced width according to weather and traffic conditions. [For clean rooms, delete standard pile weatherstripping and insert: For clean room applications, weatherstripping shall be rubber vinyl]. [Insert, if applicable: Provide automatic locking system, hydraulic closers, battery packs, alarm contact monitoring, thresholds].

2.03 OPERATING CONDITIONS:

A. Climatic Conditions: All automatic sliding door system components shall operate between -30 degrees F and +130 degrees F in all climatic conditions.

PART THREE EXECUTION

3.01 INSPECTION:

A. Verify that the automatic sliding door system installation will not disrupt other trades. The door installer shall verify that the installation area is dry, clean and free of foreign matter. Check as-built conditions and verify the manufacturer's automatic sliding entrance system details for accuracy to fit the wall assembly prior to fabrication. Report in writing to the Contractor any detrimental conditions to the proper functioning of the automatic sliding entrance system. Installation shall proceed once the unsatisfactory conditions have been corrected in accordance to the manufacturer's recommendations.

3.02 INSTALLATION OF AUTOMATIC SLIDING DOOR SYSTEMS:

A. Installation shall be by an installer approved and trained by the manufacturer in strict accordance with the manufacturer's instructions and fire marshall's listing requirements.

B. Comply with the automatic sliding door system manufacturer's recommendations and/or installation guide when installing the automatic sliding entrance system. Set all units plumb, level and true.

C. Provide all fasteners required for installation of the automatic sliding door system.

D. Adjustment and Cleaning: After repeated operation of the completed installation, re-adjust door operators and controls for optimum operating condition and safety. Clean all metal surfaces promptly after installation.

E. Explain and review the Daily Safety Check Procedure.

END OF SECTION

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 SUMMARY

A. This section includes the following:

1. Commercial door hardware for the following:

a. Swinging doors.
b. Other doors to the extent indicated.

2. Electrified door hardware.

B. Related Sections include the following:

1. Section 08110 – Steel Doors and Frames
2. Section 08210 – Flush Wood Doors
2. Section 08411 – Aluminum-Framed Entrances and Storefronts
3. Section 16660 – Access Control and Security System

1.03 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, door fabrication templates, and finishes.

B. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: Power, signal, and control wiring. The following shall be included as a minimum:

a. System schematic.
b. Point to point wiring diagrams.
c. Riser diagram.
d. Elevation view of each door

2. Detail interface between the electrified door hardware and the access control and security system.

3. Descriptions/details of preparations required for frames to accept hardware. Coordinate with frame manufacturer/supplier.

C. Product Certificates:

1. Certify that the door hardware approved for use on labeled fire doors complies with the listed fire door assemblies.

D. Door Hardware Schedule: Prepared by or under the supervision of the supplier. Coordinate the final Door Hardware Schedule with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.

1. Format: Use the same scheduling sequence, door numbers, etc., as found in the Contract Documents.

2. Organization: Organize the schedule into door hardware groups indicating doors by number, location and complete designations of every item required for each door or opening.

3. Content: Include the following information in each group:

a. Door number
b. Door location (i.e. Room 106 from Room 101)
c. Door and frame type and size
d. Description of item (i.e. Hinges, Lock, etc.)
e. Quantity required for each door opening
f. Manufacturer and Model Number of each item
g. Type, style, function, size, label, hand and finish of each item
h. Fastenings and other pertinent information
i. Description of each electrified door hardware function, including location, sequence of operation, and interface with the access/security system. Coordinate sequence of operation with the Security system to assure that the hardware is correct for the intended opening, i.e. electric strike vs electric lock, power transfer devise required, device's fail condition, etc.

4. Submittal Sequence: Submit the final Door Hardware Schedule at the earliest possible date, particularly where approval of the hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include all pertinent information essential to the coordinated review of the Door Hardware Schedule.

E. Maintenance Data: Include specific manufacturer's literature, exploded parts views, etc., for each type of door hardware to include in the operations and maintenance manuals as specified in Section 01770.

F. Warranties: Special warranties specified in this section.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer, approved by the hardware manufacturer, who has completed door hardware installations similar in material, design and extent to that indicated for this Project and whose work has resulted in successful installations as evidenced by referrals from previous project Owner's maintenance personnel.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect and Owner about door hardware and keying.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

D. Regulatory Requirements: Comply with provisions of the following:

1. Comply with accessibility requirements of the Americans with Disabilities Act (ADA) "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:

a. Handles, pulls, latches, locks and other operating devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching or twisting of the wrist.

b. Door closers: Comply with the following maximum opening-force requirements;

1) Interior hinged doors - 5 lbf applied perpendicular to the door.

2) Fire doors: Minimum opening force allowable by authorities having jurisdiction.

c. Thresholds: Not more than ½-inch total height. Bevel raised thresholds with a slope of not more than 1:2.

2. NFPA 101: Comply with the following for means of egress doors.

a. Latches, locks and exit devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool or special knowledge for operation.

b. Door closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

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

E. Fire Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated.

1.05 PRE-INSTALLATION CONFERENCE

A. Conduct a pre-installation conference at the project site complying with the requirements of Section 01039 Coordination and Meetings. Review methods and procedures related to installation of hardware including, but not limited to, the following:

1. Review sequence of operation and interface of electrified hardware with Access/Security system.
2. Review and modify if necessary the construction schedule to reflect the work effort required to install, adjust, clean, and test the hardware.

1.06 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the groupings in the final Door Hardware Schedule. Include basic installation instructions with each item.

C. Deliver keys and permanent cores to the Owner by registered mail. Locksets to be delivered to the site with temporary construction cores.

1.07 COORDINATION

A. Coordinate layout and installation of recessed hardware with building construction. Cast anchoring inserts into concrete. See Specification Section 03300 “Cast in Place Concrete” for concrete, reinforcement and formwork requirements.

B. Templates: Obtain and distribute to the parties involved templates for doors, frames and other work specified to be factory prepared for installing 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.

C. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to related systems. Examples include but are not limited to door hold open devices connected to the building fire alarm system, and electric strikes connected to the Access/Security system.

D. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications are required to reuse existing door hardware, field verify the existing conditions and coordinate the installation to suit.

1.08 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within 3 years of substantial completion. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking or breakage.
2. Faulty operation of operators and door hardware.
3. Deterioration of metals, metal finishes and other materials beyond normal wear.

C. Warranty shall last three years from the date of substantial completion, unless manufacturer's warranty is longer. Shorter manufacturer's warranties shall be extended by the Contractor.

1.09 MAINTENANCE TOOLS

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

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide door hardware for each door to comply with requirements in this Section, the Door Hardware Schedule at the end of this section, and required to meet the operational sequence as specified herein and/or other Contract Documents.

B. Requirements for design, grade, function, finish, size and other distinctive characteristics of each type of door hardware are as indicated in the Door Hardware Schedule at the end of this Section. Products are identified by naming manufacturer's products for each door hardware type required for the purpose of establishing minimum requirements. Where only one manufacturer is listed for a particular item(s), there are no substitutions allowed.

C. Requests for substitutions for products by manufacturers not listed below must be received in the architects office no less than ten (10) days prior to the scheduled bid opening date and must include all relevant technical data for the proposed product.

2.02 BUTT HINGES

A. Hinges are identified in the hardware sets. Furnish hinges in quantities and sizes that conform to all applicable codes and standards and accepted industry practices.

Specified Manufacturer- Hager Products
Approved Manufacturers- Ives; McKinney

2.03 LOCKS AND LATCHES

A. Mechanical Locks
Lock functions are specified in the Hardware Sets. Furnish the specified product or one equal in grade, function and finish to the specified product.

Specified Manufacturer-
Exterior Doors- Schlage LV9000 series Grade 1 Vandal Resistant High Security Mortise Lock
Interior Doors- Schlage ND series Grade 1 Heavy-duty Cylindrical locks

Submit requests for substitutions in accordance with the General Conditions and Paragraph
2.01C above.

B. Electromagnetic Locks

Specified Manufacturer- Schlage Electronics

Approved Manufacturers - Securitron

C. Electric Strikes

Specified Manufacturer- Von Duprin

Approved Manufacturers- HES

2.07 DOOR TRIM AND ACCESSORIES (Bolts, Stops, Flat Goods, Silencers)

A. Specified Manufacturer- Hager Products

Approved Manufacturer- Ives, Rockwood

2.08 EXIT DEVICES
A. Mechanical and Electronic Exit Devices, Including Power Supplies and Power Transfers

Specified Manufacturer- Von Duprin

Submit requests for substitutions in accordance with the General Conditions and Paragraph 2.01C above.

2.09 DOOR CLOSERS

A. .Specified Manufacturer LCN 4040 and 1461 series

Approved Manufacturers Corbin-Russwin DC8000 and DC6200

2.10 OVERHEAD DOOR HOLDERS/STOPS

A. Specified Manufacturers - Glynn-Johnson

Approved Manufacturers - Rixson

2.11 DOOR GASKETING

A. Specified Manufacturer- Hager Products

Approved Manufacturers- National Guard Products

2.11 FABRICATION

A. Manufacturer's nameplate: Do not provide manufacturer's products that have manufacturer's name or trade name displayed in a visible location, when the door is in the closed position, except in conjunction with required fire rated labels and as otherwise approved by the Architect.

B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not acceptable unless specifically approved by the A/E on a case by case basis. Provide Phillips flat head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow metal door and frame construction, provide sleeves for each through bolt.

2. Steel Machine or Wood Screws: For the following fire rated applications:

   a. Mortise hinges to doors.
   b. Strike plates to frames.
   c. Closers to doors and frames

3. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2 "Recommended Fasteners for Wood Doors."

2.12 FINISHES

A. Hardware finish in general is to be satin nickel, 619 or stainless steel, 630 as shown in the hardware sets. Furnish door closers in sprayed aluminum finish (689); thresholds and weatherstrip in mill aluminum finish.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

2.13 KEYING REQUIREMENTS

A. Supplier to meet with Owner or Owners agent to determine final keying requirements. In general, a new masterkey will be set-up for this project and locks will be keyed in sets according to the wishes of the owner. Furnish (10) Masterkeys and (2) keys per lock.

B. All locks shall be provided with either temporary cores or factory construction keyed cores using one key (ship removal key to Owner) for use during construction. All locksets shall be assembled complete with construction keyed cylinders at the factory. Provide (10) Construction Masterkeys to the Contractor for use during construction.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction and other conditions affecting performance.

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

C. Coordinate installation of security devices with installer of the security system, and verify correct operation prior to covering access to raceways feeding electric strikes, power transfer devices and the like.

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

3.02 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 series.

B. Surface applied door hardware: drill and tap doors and frames according to ANSI A250.6.

C. Wood Doors: Comply with DHI A115-W series.

3.03 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in the following applicable publications, unless specifically indicated or required to comply with other codes and/or local jurisdiction requirements:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

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

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

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

C. Power Supplies: Locate power supplies as indicated or, if not indicated above accessible ceilings. If not a factory assembly, provide a j-box of suitable size to contain the power supply(ies) and overload protection. Overload protection shall include a line-side disconnect and/or load side removable fuse, at each individual unit, to allow for maintenance of each power supply without isolation of the entire feeding circuit. Provide at least one power supply per door opening. Size as required to not exceed 100 va, per unit for power units supplying less than 110 volts.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified elsewhere.

3.04 ADJUSTING

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

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt. Verify correct operation when activated by the security system.
3. Closures: Adjust closures to meet the specifications stated earlier for force and pressure. Readjust after final air balancing, and verify correct adjustment with calibrated force gages. Verify that doors latch and unlatch properly when activated by the security system. Test operations in the presence of the Owner's representative.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

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

3.06 OPERATIONS AND MAINTENANCE MANUALS AND TRAINING

A. Provide operations and maintenance manuals as described in Section 01770. Manuals shall include complete manufacturer's installation instructions and parts manuals for all hardware items.

B. Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate and maintain door hardware and door hardware finishes.

3.07 HARDWARE SCHEDULE

A. The following is a list of minimum hardware items to be provided when called out in the hardware schedule. Coordinate work of other trades to insure a complete and operable installation including but not limited to fire alarm and security components that interface with the hardware items specified herein. Coordinate quantities and handing of hardware items where pairs or multiple doors occur at the specified opening.

HW SET: 01

BALANCE OF HARDWARE BY DOOR MFR

1	EA	MORTISE CYLINDER	20-013	626	SCH

HW SET: 02

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	CARD READER	FURNISHED BY OTHERS		B/O
1	EA	ELECTROMAGNETIC LOCK	M450	628	SCE
1	EA	PUSH PLATE	30S 4 X 16	619	HAG
1	EA	PULL PLATE	31E 4 X 16	619	HAG
1	EA	KICK PLATE	8" X 2" LDW X .050"	619	HAG
1	EA	SURFACE CLOSER	1461 HCUSH	689	LCN
3	EA	SILENCERS	307D	GRY	HAG
1	EA	POWER SUPPLY	PS902		SCE
1	EA	KEYSWITCH	653-04 X CYL	630	SCE

HW SET: 03

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	STOREROOM LOCK	ND80PD ATH	619	SCH
1	EA	OVERHEAD HOLDER	450F	630	GLY
3	EA	SILENCERS	307D	GRY	HAG

HW SET: 04

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	OFFICE LOCK	ND50PD ATH	619	SCH
1	EA	WALL STOP	236W	619	HAG
3	EA	SILENCERS	307D	GRY	HAG

HW SET: 05

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	STOREROOM LOCK	ND80PD ATH	619	SCH
1	EA	CARD READER	FURNISHED BY OTHERS		B/O
1	EA	ELECTRIC STRIKE	6211 FS 24VDC	630	VON
1	EA	SURFACE CLOSER	1461 RW/PA	689	LCN
1	EA	FLOOR STOP	242F	619	HAG
3	EA	SILENCERS	307D	GRY	HAG

HW SET: 06

5	EA	HINGE	BB1191 4.5 X 4.5 NRP	32D	HAG
1	EA	ELEC HINGE	BB1191 4.5 X 4.5 NRP ETW-8	32D	HAG
2	EA	FLUSHBOLTS	282D	26D	HAG
1	EA	CARD READER	FURNISHED BY OTHERS		B/O
1	EA	EU STOREROOM LOCK	LV9080PEU 07A	619	SCH
1	EA	ASTRAGAL	BY DOOR MFR	600	STE
2	EA	SURFACE CLOSER	4040 HCUSH	689	LCN
1	EA	WEATHERSTRIP	891SAS X LAR HEAD & JAMBS	AL	HAG
1	EA	THRESHOLD	532SAV X LAR	AL	HAG

HW SET: 07

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	PASSAGE SET	ND10S ATH	619	SCH
1	EA	SURFACE CLOSER	1461 RW/PA	689	LCN
1	EA	WALL STOP	236W	619	HAG
3	EA	SILENCERS	307D	GRY	HAG

HW SET: 08

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	PRIVACY SET	ND40S ATH	619	SCH

1	EA	SURFACE CLOSER	1461 RW/PA	689	LCN
1	EA	FLOOR STOP	242F	619	HAG
3	EA	SILENCERS	307D	GRY	HAG

HW SET: 09

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	PANIC HARDWARE	98L-BE 996L 3'	619	VON
1	EA	KICK PLATE	8" X 2" LDW X .050"	619	HAG
1	EA	SURFACE CLOSER	1461 RW/PA	689	LCN
1	EA	FLOOR STOP	242F	619	HAG
3	EA	SILENCERS	307D	GRY	HAG

HW SET: 10

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	STOREROOM LOCK	ND80PD ATH	619	SCH
1	EA	SURFACE CLOSER	1461 RW/PA	689	LCN
1	EA	FLOOR STOP	242F	619	HAG
3	EA	SILENCERS	307D	GRY	HAG

HW SET: 11

3	EA	HINGE	BB1191 4.5 X 4.5 NRP	32D	HAG
1	EA	POWER TRANSFER	EPT10	626	VON
1	EA	ELEC EXIT DEVICE	CX98EO	630	VON
1	EA	MORTISE CYLINDER	20-001 1-1/4"	626	SCH
1	EA	SURFACE CLOSER	4041	689	LCN
1	EA	WEATHERSTRIP	891SAS X LAR HEAD & JAMBS	AL	HAG
1	EA	THRESHOLD	532SAV X LAR	AL	HAG
1	EA	POWER SUPPLY	PS902		SCE

HW SET: 12

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	STOREROOM LOCK	ND80PD ATH	619	SCH
1	EA	WALL STOP	236W	619	HAG
3	EA	SILENCERS	307D	GRY	HAG

HW SET: 13

4	EA	HINGE	1279 4.5 X 4.5	619	HAG
2	EA	ROLLER LATCH	320R	626	HAG
2	EA	WIRE PULL	305D	619	HAG

HW SET: 14

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	PUSH PLATE	30S 4 X 16	619	HAG
1	EA	PULL PLATE	31E 4 X 16	619	HAG
1	EA	MOP PLATE	4" X 1" LDW X .050"	619	HAG
1	EA	KICK PLATE	8" X 2" LDW X .050"	619	HAG
1	EA	SURFACE CLOSER	1461 RW/PA	689	LCN
1	EA	FLOOR STOP	242F	619	HAG
3	EA	SILENCERS	307D	GRY	HAG

HW SET: 15

6	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
2	EA	FLUSHBOLT	283D	26D	HAG
1	EA	STOREROOM LOCK	ND80PD ATH	619	SCH
1	EA	ASTRAGAL	BY DOOR MFR	600	STE
2	EA	OVERHEAD HOLDER	450F	630	GLY
2	EA	SILENCERS	307D	GRY	HAG

HW SET: 16

3	EA	HINGE	BB1191 4.5 X 4.5 NRP	32D	HAG
1	EA	PANIC HARDWARE	98L-DT 996L-DT 3'	619	VON
1	EA	SURFACE CLOSER	4040 HCUSH	689	LCN
1	EA	WEATHERSTRIP	891SAS X LAR HEAD & JAMBS	AL	HAG
1	EA	THRESHOLD	532SAV X LAR	AL	HAG

HW SET: 17

6	EA	HINGE	BB1191 4.5 X 4.5 NRP	32D	HAG
2	EA	FLUSHBOLTS	282D	26D	HAG
1	EA	STOREROOM LOCK	LV9080P 07A	630	SCH
1	EA	ASTRAGAL	BY DOOR MFR	600	STE
2	EA	SURFACE CLOSER	4040 HCUSH	689	LCN
1	EA	WEATHERSTRIP	891SAS X LAR HEAD & JAMBS	AL	HAG
1	EA	THRESHOLD	532SAV X LAR	AL	HAG

HW SET: 18

6	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
2	EA	PUSH PLATE	30S 4 X 16	619	HAG
2	EA	PULL PLATE	31E 4 X 16	619	HAG
2	EA	MOP PLATE	4" X 1" LDW X .050"	619	HAG
2	EA	KICK PLATE	8" X 2" LDW X .050"	619	HAG
2	EA	SURFACE CLOSER	1461 RW/PA	689	LCN
2	EA	FLOOR STOP	242F	619	HAG
2	EA	SILENCERS	307D	GRY	HAG

HW SET: 19

3	EA	HINGE	BB1279 4.5 X 4.5	619	HAG
1	EA	DEADBOLT	B662P	626	SCH
1	EA	PUSH PLATE	30S 4 X 16	619	HAG
1	EA	PULL PLATE	31E 4 X 16	619	HAG
1	EA	KICK PLATE	8" X 2" LDW X .050"	619	HAG
1	EA	SURFACE CLOSER	1461 HCUSH	689	LCN
3	EA	SILENCERS	307D	GRY	HAG

END OF SECTION 08710

SECTION 08800 – GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass and plastic glazing.

B. Plastic glazing film.

C. Glazing compounds and accessories.

1.02 RELATED SECTIONS

A. Section 06200 - Finish Carpentry.

B. Section 07900 – Joint Sealers: Sealant and back-up material.

C. Section 08211 – Flush Wood Doors: Glazed doors.

D. Section 08590 – Window Restoration and Replacement.

1.03 REFERENCES

A. ANSI Z97.1 – American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 1984 (R1994).

B. ASTM C 669 – Standard Specification for Glazing Compounds for Back Bedding and Face Glazing of Metal Sash; 1995.

C. ASTM C 864 – Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 1999.

D. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants; 1998.

E. ASTM C 1036 – Standard Specification for Flat Glass; 1991 (Reapproved 1997).

F. ASTM C 1048 – Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 1997b.

G. ASTM C 1172 – Standard Specification for Laminated Architectural Flat Glass; 1996.

H. ASTM C 1193 – Standard Guide for Use of Joint Sealants; 1991 (Reapproved 1995).

I. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials;

1999.

J. ASTM E 773 – Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units; 1997.

K. ASTM E 774 – Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units; 1997.

L. ASTM E 1300 – Standard Practice for Determining Load Resistance of Glass in Buildings; 1998.

M. GANA (GM) – GANA Glazing Manual; Glass Association of North America; 1997.

N. GANA (SM) – FGMA Sealant Manual; Glass Association of North America; 1990.

O. GANA (LGDG) – Laminated Glass Design Guide; Glass Association of North America; 1994.

P. SIGMA TM-3000 – Glazing Guidelines for Sealed Insulating Glass Units; Sealed Insulating Glass Manufacturers Association; 1997.

Q. SIGMA TM-3000 and TB-3001 – Recommended Practices for Vertical and Basic Field Glazing of Organically Sealed Insulating Glass Units; Sealed Insulating Glass Manufacturing Association; 1990.

1.04 PERFORMANCE REQUIREMENTS

A. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:
   1. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
   3. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

B. Select type and thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with applicable code.
   1. Use the procedure specified in ASTM E 1300 to determine glass type and thickness.
   2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
   3. Thicknesses listed are minimum.

Low-E Clear Insulating Glass "Solarban®" 60 (2) Clear + Clear by PPG Industries, Inc. See Construction Documents for the basis of design.

Performance Values

Visible Light Transmission	U-Value Winter	U-Value Summer	SHGC	Shading Coefficient	Outdoor Visible Light Reflectance

70%	0.29	0.27	0.38	0.44	11%

1.05 SUBMITTALS

A. See Section 01300 – Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit two samples ten (10) x twelve (12) inch in size of glass and plastic units, showing coloration and design.

E. Samples: Submit six (6) inch long bead of glazing sealant, verify color.

F. Certificates: Certify that products meet or exceed specified requirements.

G. Manufacturer's Certificate: Certify that glass meets or exceeds specified requirements.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience.

C. Installers:
   1. Please provide/to be provided by contractor prequalified.

1.07 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.09 WARRANTY

A. See Section 01780 – Closeout Submittals, for additional warranty requirements.

B. Provide a five (5) year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

C. Provide a five (5) year warranty to include coverage for delamination of laminated glass and replacement of same.

1.10 MAINTENANCE PRODUCTS

A. Provide two of each glass size and each glass type, of insulated glass units.

PART 2 PRODUCTS

2.01 FLAT GLASS MATERIALS

A. Manufacturers:
   1. AFG Industries, Inc.
   2. Guardian Industries Corp.
   3. Pilkington Libbey-Owens-Ford.
   4. PPG Industries, Inc.
   5. Visteon Glass Systems.
   6. Substitutions: Refer to Section 01600 – Product Requirements.

B. Clear Float Glass: Solar Gray
   1. Comply with ASTM C 1036, Type I, transparent flat, Class 1 Solar Gray , Quality q3 glazing select.
   2. Comply with ASTM C 1048, Condition A uncoated, Type I, transparent flat, Class 1, Quality q3 glazing select.

C. Safety Glass: Solar Gray; fully tempered with horizontal tempering.
   1. Comply with ASTM C 1048, Condition A uncoated, Type I, transparent flat, Class 1, Quality q3 glazing select.
   2. Comply with ANSI Z97.1.

2.02 SEALED INSULATING GLASS MATERIALS

A. Manufacturers:
   1. Any of the manufacturers listed under Flat Glass Materials.
   2. Guardian Industries Corp.
   3. Interpane Glass Co.
   4. Viracon, Apogee Enterprises, Inc.

B. Insulated Glass Units: Double pane with glass to elastomer edge seal.
   1. Comply with ASTM E 774 and E 773, Class CBA.
   2. Purge interpane space with dry hermetic air.
   3. Total unit thickness of one (1) inch.

C. Edge Seal Construction: Aluminum, bent and soldered corners.

2.03 GLAZING COMPOUNDS

A. Manufacturers:
   1. Dow Corning Corp.
   2. GE Silicones.
   3. Pecora Corp.

B. Butyl Sealant: Single component; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; Shore A hardness of 10 to 20; black color; non-skinning.

G. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25.

2.07 GLAZING ACCESSORIES

A. Manufacturers:
   1. Norton Performance Plastics Corp.
   2. Pecora Corp.
   3. Tremco, Inc.

B. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.

C. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch (75 mm) long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C 864 Option I; Black color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C 1193 and FGMA Sealant Manual.

E. Install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

A. Place setting blocks at 1/4 points with edge block no more than 6 inches (150 mm) from corners.

B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

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

3.04 INSTALLATION - EXTERIOR BUTT GLAZED METHOD (SEALANT ONLY)

A. Temporarily brace glass in position for duration of glazing process. Mask edges of glass at adjoining glass edges and between glass edges and framing members.

B. Temporarily secure a small diameter non-adhering foamed rod on back side of joint.

C. Apply sealant to open side of joint in continuous operation; thoroughly fill the joint without displacing the foam rod. Tool the sealant surface smooth to concave profile.

D. Permit sealant to cure then remove foam backer rod. Apply sealant to opposite side, tool smooth to concave profile.

E. Remove masking tape.

3.05 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

END OF SECTION

THROUGH WALL SYSTEMS

Product: Extended Kwik Drop Ensemble
Catalog #: 15-8975

Date of this Revision: December 30, 2009. Go to www.kingsley.com for all updates.
Specifications subject to change without notice. MADE IN THE USA

INCLUDED WITH THIS SYSTEM:
A complete ready to install through wall two-piece system with new advanced Kingsley features.
Ensemble includes:
Exterior faceplate with weather shroud. KwikDrop Depository and Entry chute. The shroud for this system extends 9-3/4" toward the curb for easier drive-up deposits. Interior 19-inch long non-obstructing chute and enclosure, KwikLock System and AirBlock System. **Note:** The KwikLock system is an integral part of the faceplate/chute assembly and is not available separately.

TRANSPORT CARTS USED WITH THIS SYSTEM:
Use with any Kingsley Transport Cart with a height of 30 inches or less. Except Model # 30-9360

ACCESSORIES FOR THIS SYSTEM
99-8100 Braille label reading "Book Drop"
99-8105 reading "Video Drop"
50-0065 Chute Insulation Kit
Custom wording available at additional cost.

THROUGH WALL EXTERIOR CONSTRUCTION/FEATURES

Construction Materials:	All stainless steel exterior faceplate, weather shroud, depository door and entry chute. #4 finish.
Construction Methods:	The exterior portion of the chute has an upward angle and is welded to the bottom of the weather shroud. All seams completely welded. The depository door has a spring-loaded hinge welded in place. Weather stripping around depository door to prevent metal-to-metal banging. All exposed edges are de-burred and sanded smooth. Designed to be maintenance free.

THROUGH WALL INTERIOR CONSTRUCTION/FEATURES

Construction Materials:	**Chute Housing**: All stainless steel sides and top cover **Chute**: Stainless steel **Rear cover plate**: Stainless steel **Locking plates**: Aluminum **AirBlock**: Decco Neoprene (40 Duro) Rubber panels. All exposed edges are de-burred and sanded smooth
Construction Methods:	The two sides and top cover of the chute housing are welded in place. The chute assembly forms the housing bottom and is smooth without holes or ridges that can obstruct the flow of deposited materials. The chute housing and chute are welded together and all exposed edges are de-burred and sanded smooth. The rear cover is attached with screws and the neoprene rubber panels are attached to the rear cover with PS adhesive DF-58. The locking cover plate is attached with screws to the top rear of the chute housing and contains the external locking lever. A label, which reads "Open" and "closed", is attached.

15-8975 Extended Kwik Drop Ensemble - Continued

ENSEMBLE FEATURES	
Weather Resistance:	The upward angle of the bottom of the shroud helps to prevent the entry of rain and snow. The extended shroud also acts as a weather hood. The Spring-loaded depository door will not blow open in most winds preventing drafts, rain and snow from entering. Caulking on the inside edges of the faceplate and Weather stripping around door create further protection from inclement weather.
Air Draft Prevention:	The AirBlock system helps to eliminate drafts caused when the depository door is opened to deposit materials.
Theft Deterrence:	The angle of the bottom of the external shroud, Length of the internal chute and the AirBlock system prevent reaching inside through the depository door and block fishing out material with a claw apparatus. The angle of the shroud also acts as a deterrent to pouring liquids into the unit.
Depository Opening Locking Method:	Easy to operate KwikLock System allows locking the depository door with a simple "Open/Close Lever.
Finish:	#4 finish.
ADA Compliancy:	ADA compliant when properly installed.
Available Wording:	BOOK RETURN, AV RETURN

DIMENSIONS	
Overall Finished:	41"L x 24 1/4"W x 18 1/2"H [508mmW x 730.3mmL x 565.2mmH]
External Faceplate: (from front of shroud to end of entry chute)	20"W x 14"L x 13"H [508mmW x 355.6mmL x 330.2mmH]
Interior Chute Assy.:	15-11/16"W x 19-13/16"L x 19-15/16"H [398mmW x 503mmL x 506mmH]
Depository opening:	15"W x 5 1/4"H [381mmL x 101.6mmH]
Product Weight:	24 lbs [12 kg]
Shipping Weight:	33 lbs [14.3 kg]
Shipping Method:	Ground

INSTALLATION (Rough cut only; please visit www.kingsley.com for complete instructions)

External Rough Cut Dimensions:	11¼"H x 18¼"W [286mmH x 464mmW]. 40-3/4" [1035.1mm] Max from external floor to bottom of rough cut opening.
Interior Rough Cut and Trim:	Keep 3" [76.2mm] horizontal from front to back then angle 90 degrees downward 7" [177.8mm] and continue horizontally through back of wall. Sides and bottom of opening trimmed with ¾"thick wood. This trim is for the installing mounting hardware.

Kingsley Kwik-Drop Installation
15-8950/15-8975

Tools Needed:

- **A.** Drill with 1/4" bit
- **B.** Pop riveter
- **C.** Screwdriver (Phillips and Flat)
- **D.** Weatherproof Caulking
- **E.** 41” of 3”x 3/4” Wood for the framing
- **F.** 3/8 Open End Wrench
- **G.** Needle Nosed Pliers

Hardware Provided:

- **A.** 11- #8 x ¾ Screws
- **B.** 6- SS pop rivets
- **C.** 4- 1-1/2" "Tamper Pruf" screws
- **D.** 2- "F" brackets
- **E.** 4- Flush Mount Screws
- **F.** 2- 4 way cable mounts
- **G.** 2- cable ties

Step 1: Complete the wall cutout according to Figure. 1 below.

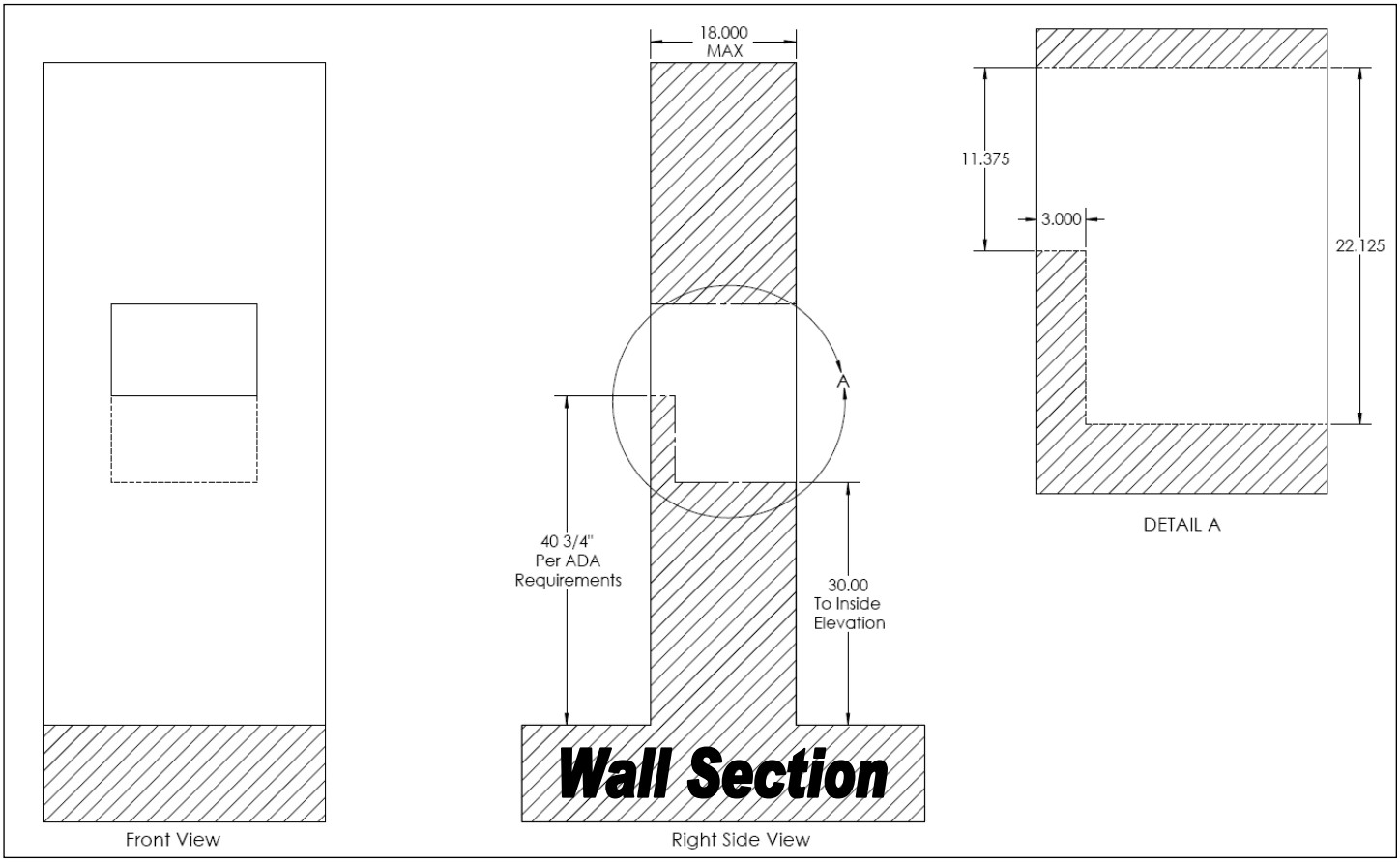


Figure 1. Internal Wall Cutout

Step 2: Once the Wall Cutout has been completed as shown in Figure. 1, make the wall framing as shown in Figure 2.

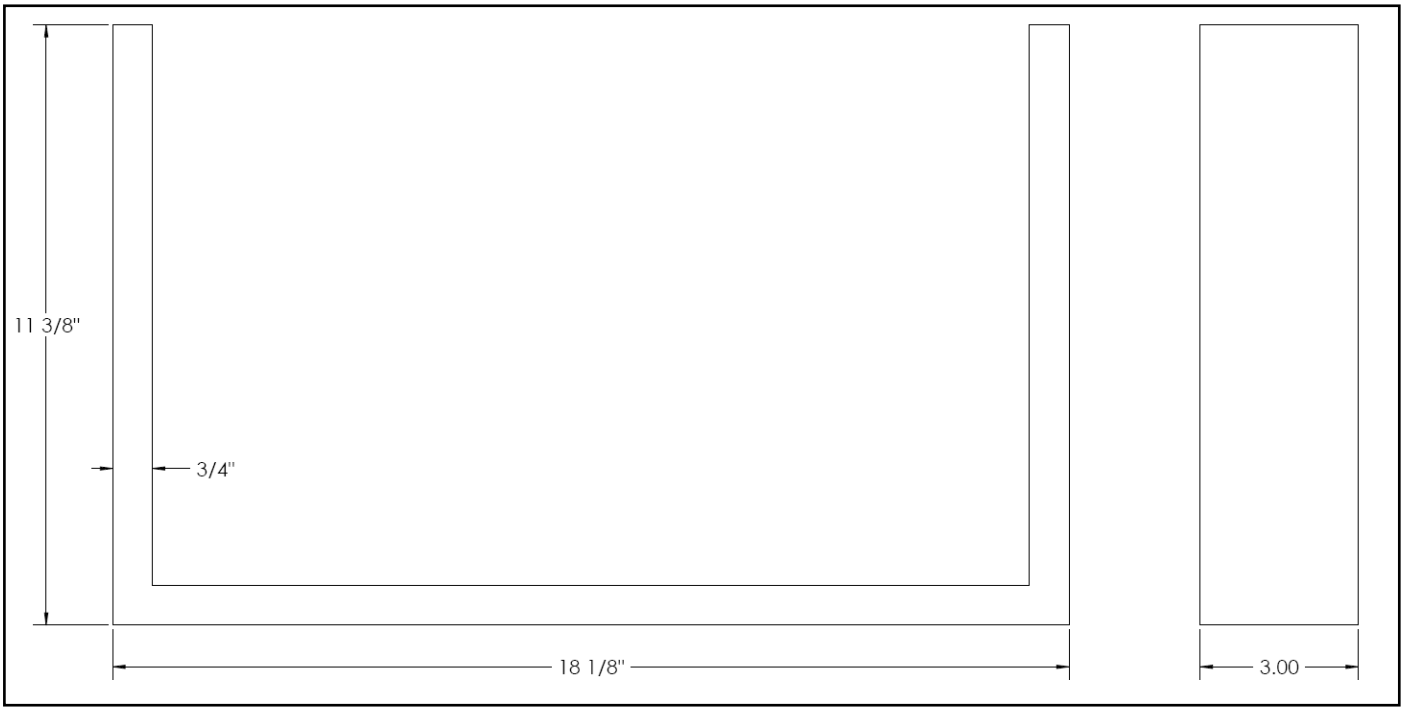


Figure 2. Internal Framing constructed of ¾" wood

Step 3: When the framing is complete, slide it into the wall cutout as shown in Figure 3.

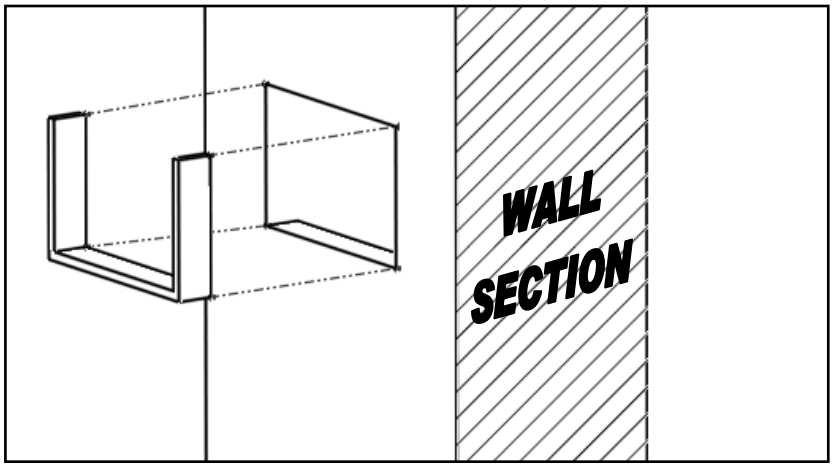


Figure 3. Insert the wooden framing into the wall cutout

Step 4: Installation should follow as shown in Figure 4.

- The “F” brackets (item F in Figure 4) can be positioned as desired to provide support for the rear chute assembly.
    - Once a suitable position is found, drill the chute with the 1/8” drill and install the pop rivets
- The letters in figure 4 Correspond to the supplied hardware list below.
- Caulk the entire area behind the faceplate as shown in Figure 4 to ensure proper weather sealing.
- The faceplate mounting screws (item A in Figure 2) are used to support the chute assembly, make sure these screws are installed into the framing.
- DWG Architectural drawings are available on the kingsley website, www.Kingsley.com

Hardware Provided:

A. 11- #8 x ¾ Screws
B. 6- SS pop rivets
C. 4- 1-1/2" "Tamper Proof" screws
D. 2- "F" brackets
E. 4- Flush Mount Screws
F. 2- 4 way cable mounts
G. 2- cable ties

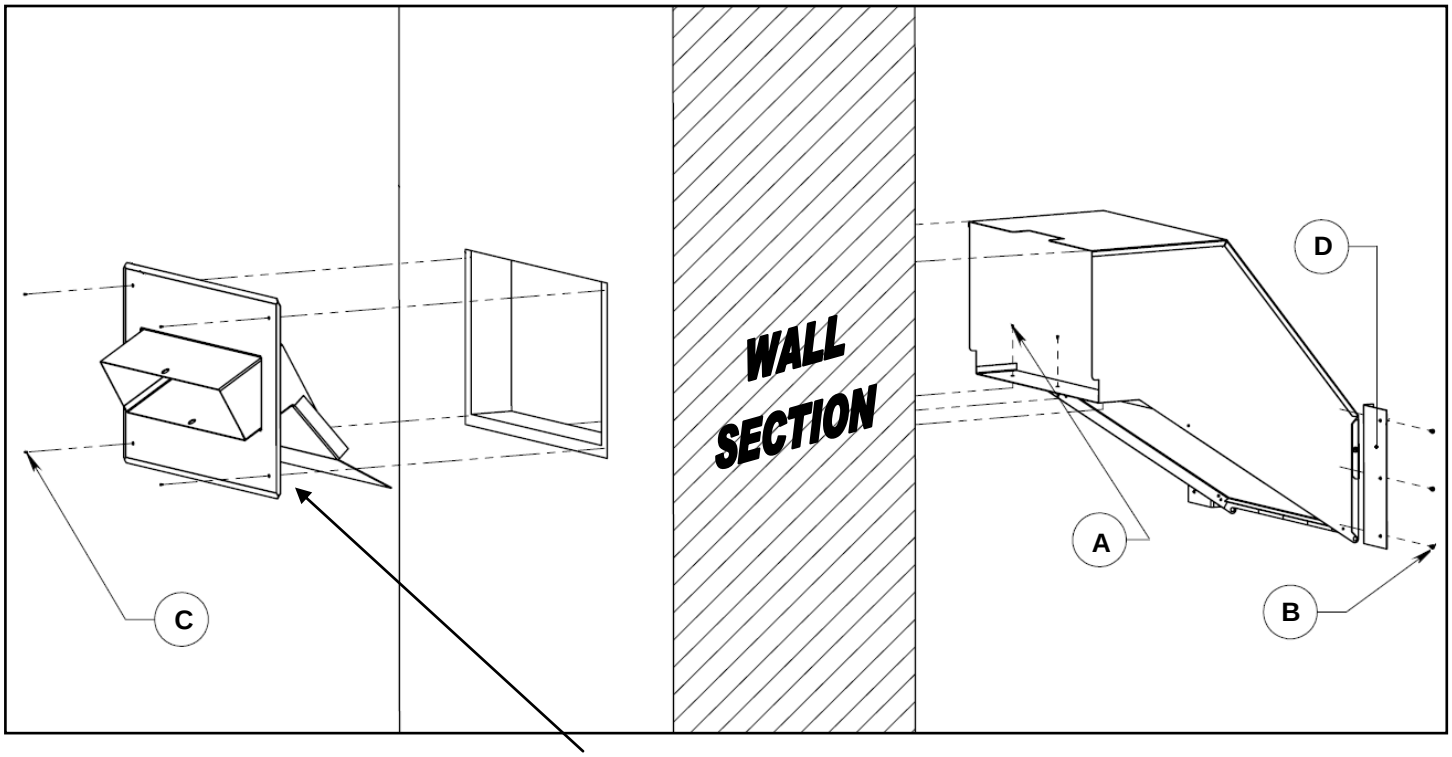
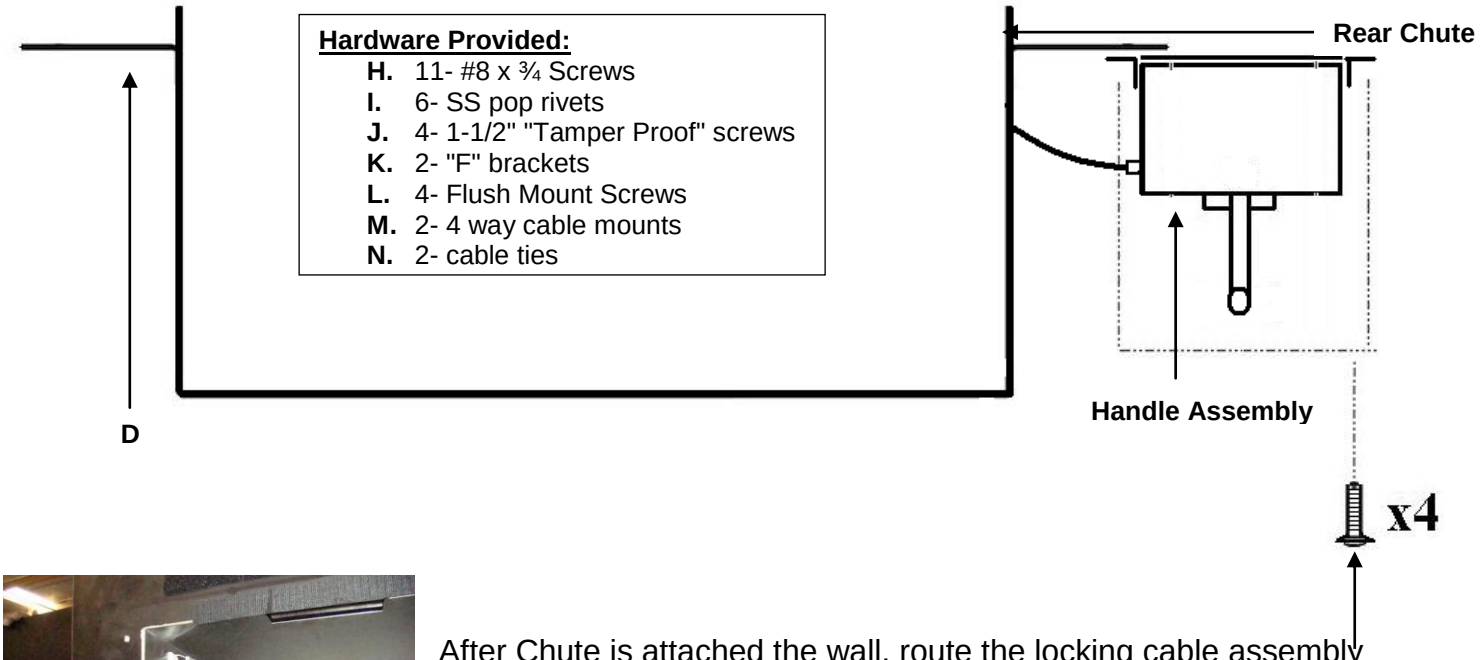


Figure 4. Faceplate Exploded View

Caulk the entire outer perimeter behind the faceplate to ensure proper weatherproofing.

Chute Top

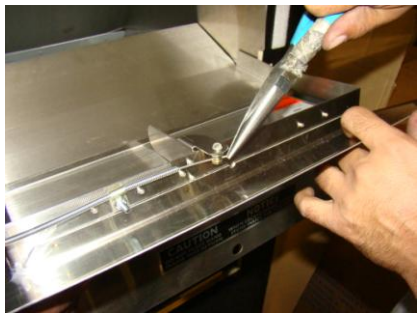


Hardware Provided:

- **H.** 11- #8 x ¾ Screws
- **I.** 6- SS pop rivets
- **J.** 4- 1-1/2" "Tamper Proof" screws
- **K.** 2- "F" brackets
- **L.** 4- Flush Mount Screws
- **M.** 2- 4 way cable mounts
- **N.** 2- cable ties

After Chute is attached the wall, route the locking cable assembly through the ¼" hole on the side of the chute. Use provided four way cable tie mounts with cable ties to secure the locking cable to the interior side of the chute. As shown in 001

At the opposing end attach the locking cable to the locking cam on the interior of the faceplate using the 3/8" wrench, 3/8" rachet, and needle nose pliers. As shown in image 002



Using the needle nose pliers bend the tip of the locking cable around the fastener. As shown in image 003

NOTES:

- Figure 6 below shows the correct heights once the installation is complete. Please make note of the ADA required faceplate height and the interior Kingsley cart clearance height.
- The interior wall trim is left up to the architect.

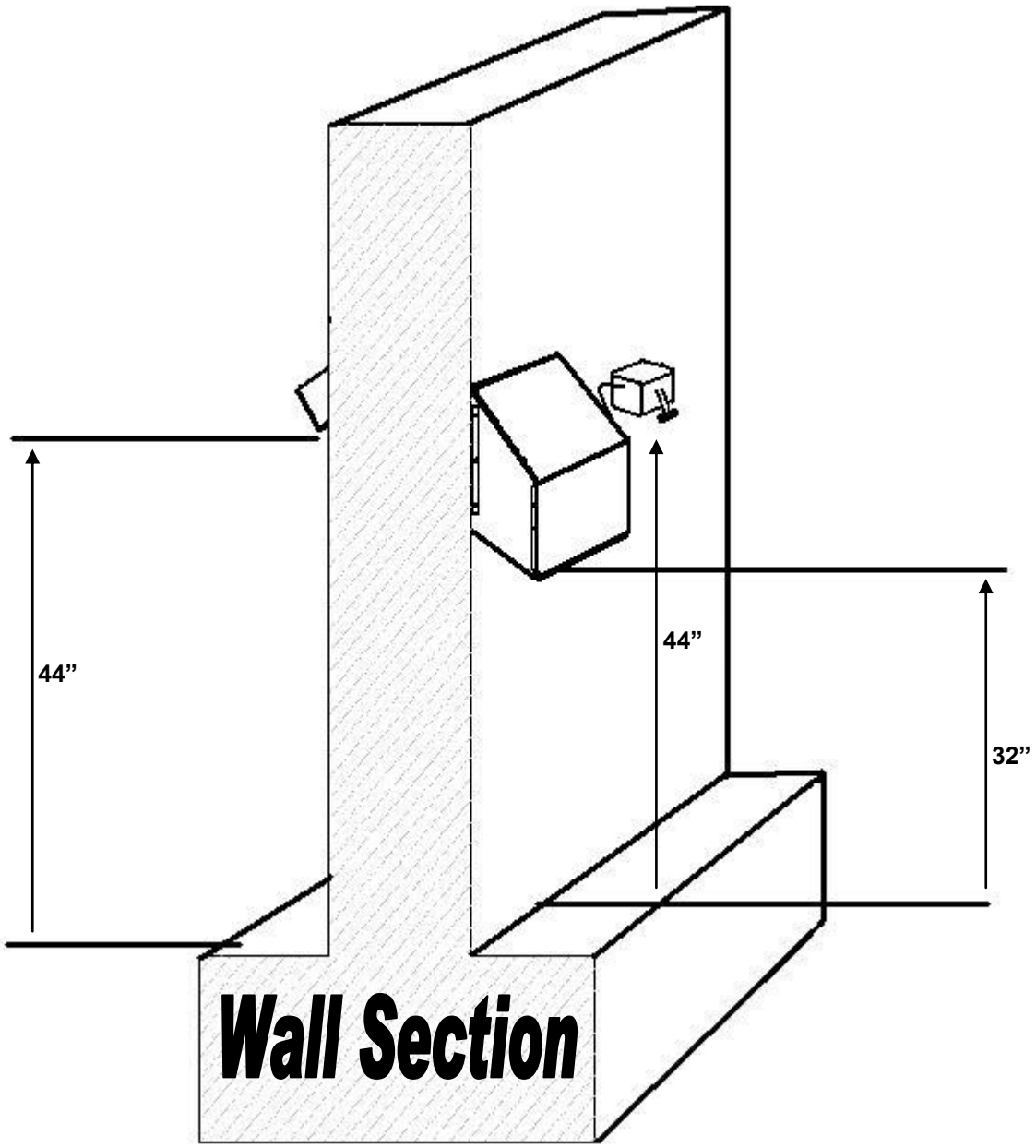


Figure 6.

Figure 6. Assembled Illustration showing heights

Figure 6. Completed Installation

WARRANTY INFORMATION for LIBRARY PRODUCTS

Effective January 1, 2009

Parts and Workmanship

All Kingsley library products have a **ONE YEAR LIMITED WARRANTY** on parts and workmanship. If any Kingsley product should fail during the initial Warranty Period, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect, alterations, vandalism, collision, Acts of God (flood, high winds, hail, etc), normal wear and tear, or uses other than intended.

Powder Coated Finishes:

All Kingsley library products with powder coated finishes have a **LIMITED SEVEN (7) YEAR WARRANTY AGAINST RUST THROUGH** in addition to the Parts and Workmanship Limited Warranty. If any Kingsley Powder Coated product should fail during the initial Warranty Period for the specific problem stated, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect (including failure to recoat scratches), alterations, vandalism, collision, Acts of God (flood, high winds, hail, etc), normal wear and tear, or uses other than intended. "Rust Through" is defined as rust that has formed an opening completely through the metal.

XtremeStainless® Finishes:

All Kingsley library products with Kingsley's XtremeStainless powder coated system have a **LIMITED TWENTY FIVE (25) YEAR WARRANTY AGAINST RUST THROUGH** in addition to the Parts and Workmanship Limited Warranty. If any Kingsley XtremeStainless® product should fail during the initial Warranty Period for the specific problem stated, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect (including failure to recoat scratches), alterations, vandalism, collision, Acts of God (flood, high winds, hail, etc), normal wear and tear, or uses other than intended. "Rust Through" is defined as rust that has formed an opening completely through the metal.

WARRANTY INFORMATION for LIBRARY PRODUCTS

Effective January 1, 2009

Stainless Steel or Aluminum Products

All Kingsley library products manufactured from Stainless Steel or Aluminum have a **LIMITED LIFETIME WARRANTY AGAINST RUST THROUGH** in addition to the Parts and Workmanship Limited Warranty. If any Kingsley stainless steel or aluminum product should fail during the initial Warranty Period for the specific problem stated, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect, alterations, vandalism, collision, Acts of God (flood, high winds, hail, etc), normal wear and tear, surface staining, oxidization, or uses other than intended. "Rust Through" is defined as rust that has formed an opening completely through the metal.

Wood Products

All Kingsley library products manufactured from wood or wood byproducts have a **LIMTED TWO (2) YEAR WARRANTY ON PARTS AND WORKMANSHIP** In lieu of the Standard One Year Parts and Workmanship Warranty. If any Kingsley wood product should fail during the initial Warranty Period for the specific problem stated, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect, alterations, vandalism, collision, Acts of God (flood, high winds, hail, etc), fires, normal wear and tear, or uses other than intended.

Book Trucks

All Kingsley Book Trucks have a **LIMITED TEN (10) YEAR WARRANTY AGAINST MANUFACTURING AND WORKMANSHIP DEFECTS.** If any Kingsley Book Truck should fail during the initial Warranty Period, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect, alterations, vandalism, collision, Acts of God, normal wear and tear, or uses other than intended.

WARRANTY INFORMATION for LIBRARY PRODUCTS

Effective January 1, 2009

These warranties give you specific legal rights, and you may also have other rights which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

THE EXPRESSED WARRANTIES MADE IN THIS WARRANTY ARE EXCLUSIVE AND MAY NOT BE ALTERED, ENLARGED, OR CHANGED BY ANY DISTRIBUTOR, DEALER OR OTHER PERSON WHATSOEVER. ALL IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY, ARE HEREBY LIMITED IN DURATION TO THE PERIOD FOR WHICH EACH WARRANTY IS GIVEN.

How to obtain Warranty Service:

Contact the Kingsley Customer Care Department:

Email:
info@kingsley.com

Telephone:
909-445-1240 Ext 121

Mail:
Kingsley Customer Care
813 Towne Center Dr
Pomona, CA 91767

Complete Warranty information is available at: www.kingsley.com/warranty

You may be required to provide product serial numbers (located on most products), photographs of the affected area, and a written explanation of the problems you are experiencing.

813 TOWNE CENTER DRIVE, POMONA, CALIFORNIA 91767
(909) 445-1240 • (800) 376-7209 • FAX (909) 445-1250
EMAIL dropbox@kingsley.com • **WEB SITE** www.kingsley.com

CARING FOR YOUR KINGSLEY RETURN

Your new Kingsley return has been manufactured under exacting quality control procedures to provide years of trouble free operation with a minimum of maintenance. Following is a list of routine maintenance items and their schedules that will keep your Kingsley return looking new and trouble-free:

Appearance:

- **Painted Steel:**
  - Kingsley uses a high-grade automotive finish on the majority of our units (some units use a powder coated finish; care instructions below).
    - Units should be washed with a mild detergent and water on a regular basis. Harsh chemicals or abrasives should never be used as they might harm the finish.
    - Once a year, the units should be polished with a regular automotive polish. When water does not "bead" on the surface it is time for a polish application.
  - Scratches should be touched up immediately as rust can form on bare metal. Kingsley has touch-up paints available to match the finish of your return. If you do not have touch-up paint available, use a primer and brush it into the scratch. Any protection is better than no protection at all.
- **Powder-Coated Finishes:**
  - Powder coated finishes need regular washing with a mild detergent and water to retain their new appearance. Polishing is usually not necessary.
  - As with "Painted Steel" above, scratches should be attended to immediately.
- **Standard Stainless Steel Finishes:**
  - Kingsley's Standard Stainless Steel Finish will maintain its new appearance for years with regular maintenance. It should be noted that stainless steel will discolor if exposed to corrosive environments including high salt content (coastal areas) and road chemicals. UNITS MUST BE REGULARLY WASHED WITH A MILD DETERGENT AND WATER. Never use harsh chemicals or abrasives on stainless steel, as they will remove the natural-forming barrier "skin" that makes stainless steel "stainless". A commercial grade stainless steel cleaner should be used to clean the unit between washings following the instructions on the label.
  - Once stainless steel is scratched or dented, there is no way to repair it. Additional washings will help to keep discoloring from forming.
  - Note: The discoloring, usually a rust color, is only discoloration. Units will probably never "rust through" or corrode.

Moving Parts:

- Doors, drawers, casters and all other moving parts should be oiled regularly using a lightweight machine oil (3in1™ or like).

THROUGH WALL SYSTEMS

Product: Extended Kwik Drop Ensemble
Catalog #: 15-8975

Date of this Revision: December 30, 2009. Go to www.kingsley.com for all updates.
Specifications subject to change without notice. MADE IN THE USA

INCLUDED WITH THIS SYSTEM:
A complete ready to install through wall two-piece system with new advanced Kingsley features.
Ensemble includes:
Exterior faceplate with weather shroud. KwikDrop Depository and Entry chute. The shroud for this system extends 9-3/4" toward the curb for easier drive-up deposits. Interior 19-inch long non-obstructing chute and enclosure, KwikLock System and AirBlock System. **Note:** The KwikLock system is an integral part of the faceplate/chute assembly and is not available separately.

TRANSPORT CARTS USED WITH THIS SYSTEM:
Use with any Kingsley Transport Cart with a height of 30 inches or less. Except Model # 30-9360

ACCESSORIES FOR THIS SYSTEM
99-8100 Braille label reading "Book Drop"
99-8105 reading "Video Drop"
50-0065 Chute Insulation Kit
Custom wording available at additional cost.

THROUGH WALL EXTERIOR CONSTRUCTION/FEATURES

Construction Materials:	All stainless steel exterior faceplate, weather shroud, depository door and entry chute. #4 finish.
Construction Methods:	The exterior portion of the chute has an upward angle and is welded to the bottom of the weather shroud. All seams completely welded. The depository door has a spring-loaded hinge welded in place. Weather stripping around depository door to prevent metal-to-metal banging. All exposed edges are de-burred and sanded smooth. Designed to be maintenance free.

THROUGH WALL INTERIOR CONSTRUCTION/FEATURES

Construction Materials:	**Chute Housing**: All stainless steel sides and top cover **Chute**: Stainless steel **Rear cover plate**: Stainless steel **Locking plates**: Aluminum **AirBlock**: Decco Neoprene (40 Duro) Rubber panels. All exposed edges are de-burred and sanded smooth
Construction Methods:	The two sides and top cover of the chute housing are welded in place. The chute assembly forms the housing bottom and is smooth without holes or ridges that can obstruct the flow of deposited materials. The chute housing and chute are welded together and all exposed edges are de-burred and sanded smooth. The rear cover is attached with screws and the neoprene rubber panels are attached to the rear cover with PS adhesive DF-58. The locking cover plate is attached with screws to the top rear of the chute housing and contains the external locking lever. A label, which reads "Open" and "closed", is attached.

15-8975 Extended Kwik Drop Ensemble - Continued

ENSEMBLE FEATURES	
Weather Resistance:	The upward angle of the bottom of the shroud helps to prevent the entry of rain and snow. The extended shroud also acts as a weather hood. The Spring-loaded depository door will not blow open in most winds preventing drafts, rain and snow from entering. Caulking on the inside edges of the faceplate and Weather stripping around door create further protection from inclement weather.
Air Draft Prevention:	The AirBlock system helps to eliminate drafts caused when the depository door is opened to deposit materials.
Theft Deterrence:	The angle of the bottom of the external shroud, Length of the internal chute and the AirBlock system prevent reaching inside through the depository door and block fishing out material with a claw apparatus. The angle of the shroud also acts as a deterrent to pouring liquids into the unit.
Depository Opening Locking Method:	Easy to operate KwikLock System allows locking the depository door with a simple "Open/Close Lever.
Finish:	#4 finish.
ADA Compliancy:	ADA compliant when properly installed.
Available Wording:	BOOK RETURN, AV RETURN

DIMENSIONS	
Overall Finished:	41"L x 24 1/4"W x 18 1/2"H [508mmW x 730.3mmL x 565.2mmH]
External Faceplate: (from front of shroud to end of entry chute)	20"W x 14"L x 13"H [508mmW x 355.6mmL x 330.2mmH]
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Depository opening:	15"W x 5 1/4"H [381mmL x 101.6mmH]
Product Weight:	24 lbs [12 kg]
Shipping Weight:	33 lbs [14.3 kg]
Shipping Method:	Ground

INSTALLATION (Rough cut only; please visit www.kingsley.com for complete instructions)

External Rough Cut Dimensions:	11¼"H x 18¼"W [286mmH x 464mmW]. 40-3/4" [1035.1mm] Max from external floor to bottom of rough cut opening.
Interior Rough Cut and Trim:	Keep 3" [76.2mm] horizontal from front to back then angle 90 degrees downward 7" [177.8mm] and continue horizontally through back of wall. Sides and bottom of opening trimmed with ¾"thick wood. This trim is for the installing mounting hardware.

Kingsley Kwik-Drop Installation
15-8950/15-8975

Tools Needed:

- **A.** Drill with 1/4" bit
- **B.** Pop riveter
- **C.** Screwdriver (Phillips and Flat)
- **D.** Weatherproof Caulking
- **E.** 41” of 3”x 3/4” Wood for the framing
- **F.** 3/8 Open End Wrench
- **G.** Needle Nosed Pliers

Hardware Provided:

- **A.** 11- #8 x ¾ Screws
- **B.** 6- SS pop rivets
- **C.** 4- 1-1/2" "Tamper Pruf" screws
- **D.** 2- "F" brackets
- **E.** 4- Flush Mount Screws
- **F.** 2- 4 way cable mounts
- **G.** 2- cable ties

Step 1: Complete the wall cutout according to Figure. 1 below.

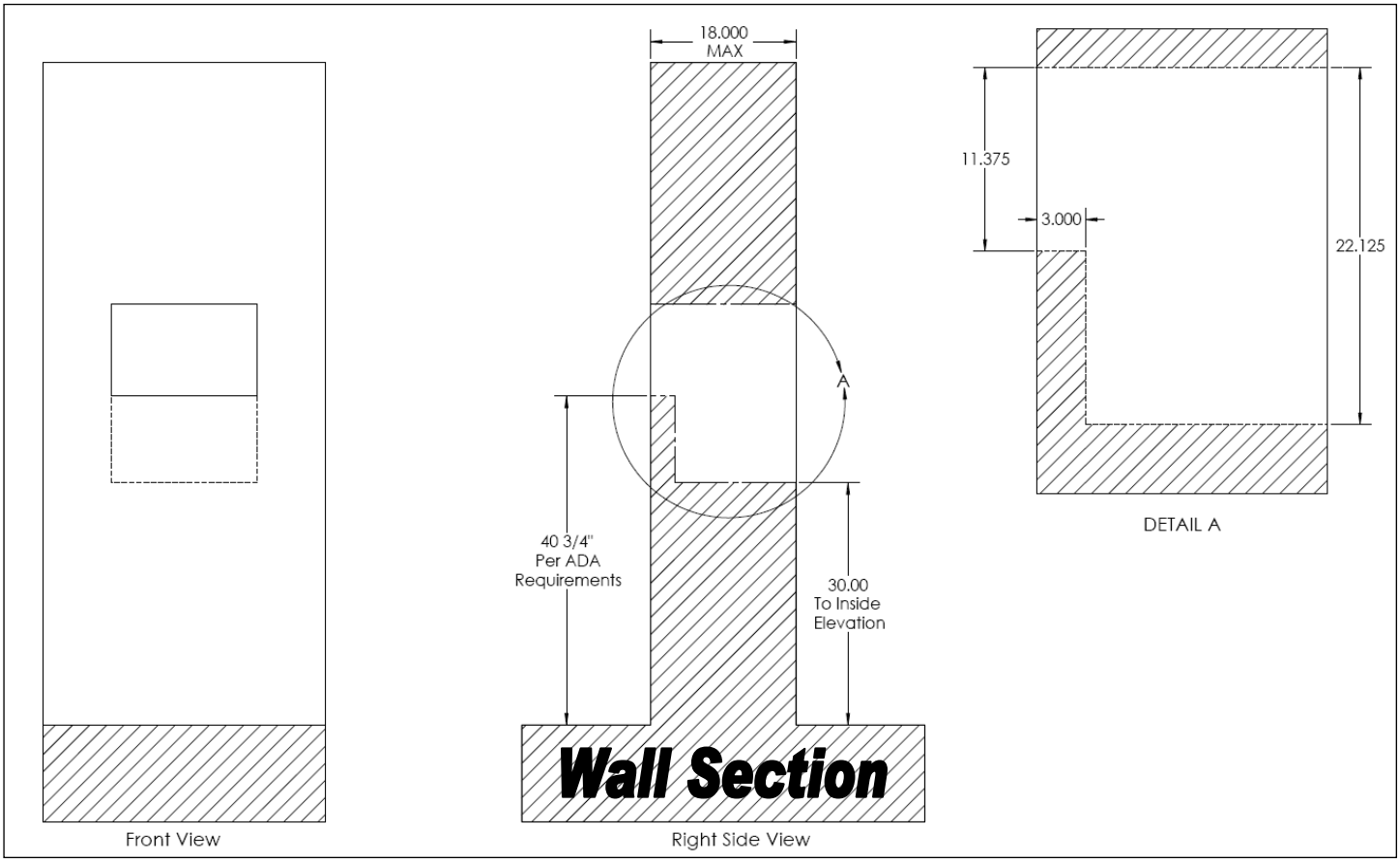


Figure 1. Internal Wall Cutout

Step 2: Once the Wall Cutout has been completed as shown in Figure. 1, make the wall framing as shown in Figure 2.

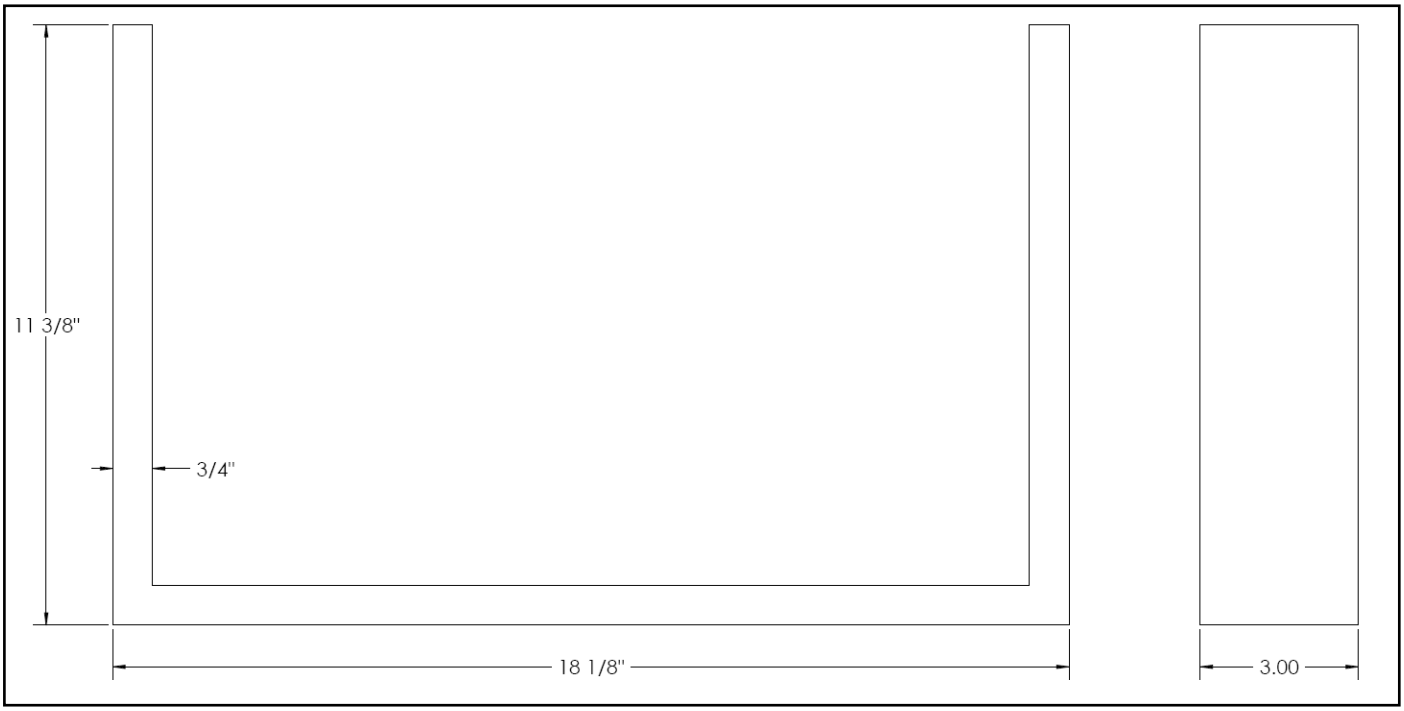


Figure 2. Internal Framing constructed of ¾" wood

Step 3: When the framing is complete, slide it into the wall cutout as shown in Figure 3.

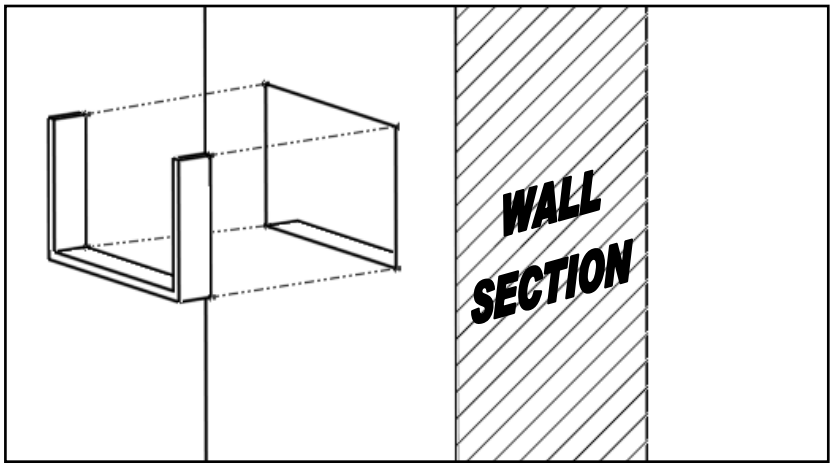


Figure 3. Insert the wooden framing into the wall cutout

Step 4: Installation should follow as shown in Figure 4.

- The “F” brackets (item F in Figure 4) can be positioned as desired to provide support for the rear chute assembly.
    - Once a suitable position is found, drill the chute with the 1/8” drill and install the pop rivets
- The letters in figure 4 Correspond to the supplied hardware list below.
- Caulk the entire area behind the faceplate as shown in Figure 4 to ensure proper weather sealing.
- The faceplate mounting screws (item A in Figure 2) are used to support the chute assembly, make sure these screws are installed into the framing.
- DWG Architectural drawings are available on the kingsley website, www.Kingsley.com

Hardware Provided:

A. 11- #8 x ¾ Screws
B. 6- SS pop rivets
C. 4- 1-1/2" "Tamper Proof" screws
D. 2- "F" brackets
E. 4- Flush Mount Screws
F. 2- 4 way cable mounts
G. 2- cable ties

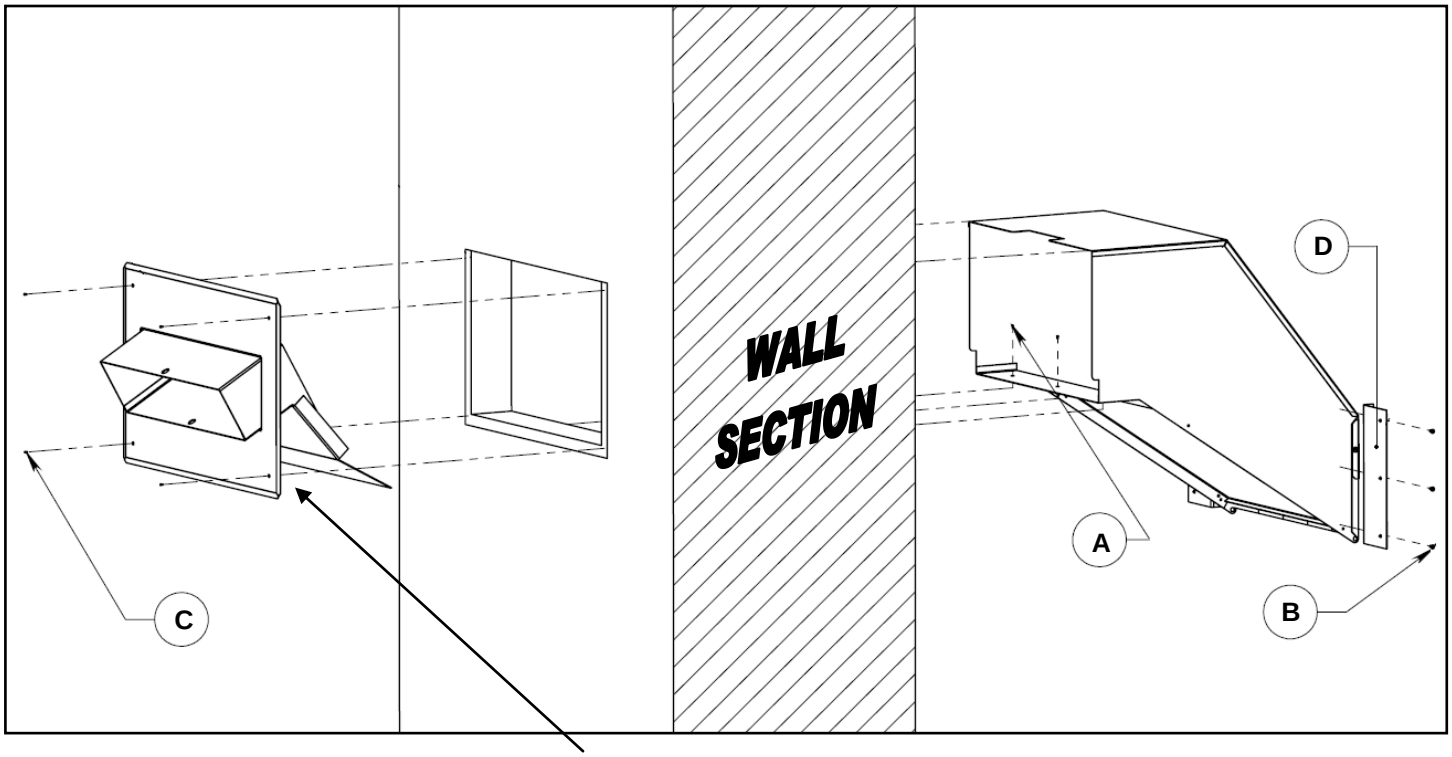
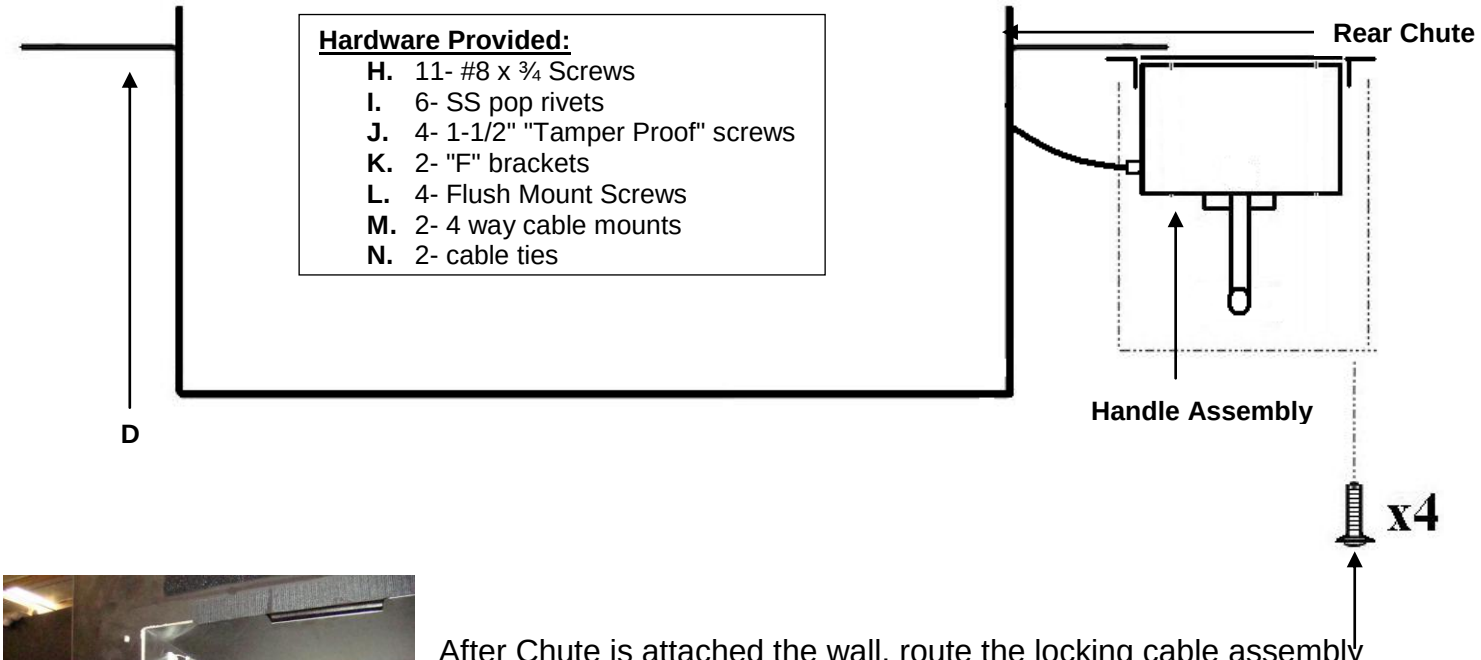


Figure 4. Faceplate Exploded View

Caulk the entire outer perimeter behind the faceplate to ensure proper weatherproofing.

Chute Top

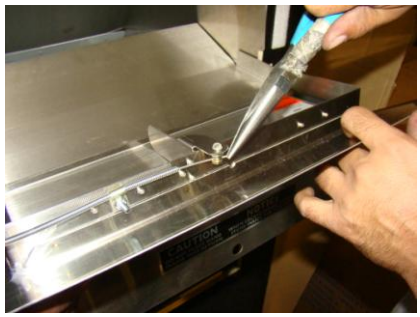


Hardware Provided:

- **H.** 11- #8 x ¾ Screws
- **I.** 6- SS pop rivets
- **J.** 4- 1-1/2" "Tamper Proof" screws
- **K.** 2- "F" brackets
- **L.** 4- Flush Mount Screws
- **M.** 2- 4 way cable mounts
- **N.** 2- cable ties

After Chute is attached the wall, route the locking cable assembly through the ¼" hole on the side of the chute. Use provided four way cable tie mounts with cable ties to secure the locking cable to the interior side of the chute. As shown in 001

At the opposing end attach the locking cable to the locking cam on the interior of the faceplate using the 3/8" wrench, 3/8" rachet, and needle nose pliers. As shown in image 002



Using the needle nose pliers bend the tip of the locking cable around the fastener. As shown in image 003

NOTES:

- Figure 6 below shows the correct heights once the installation is complete. Please make note of the ADA required faceplate height and the interior Kingsley cart clearance height.
- The interior wall trim is left up to the architect.

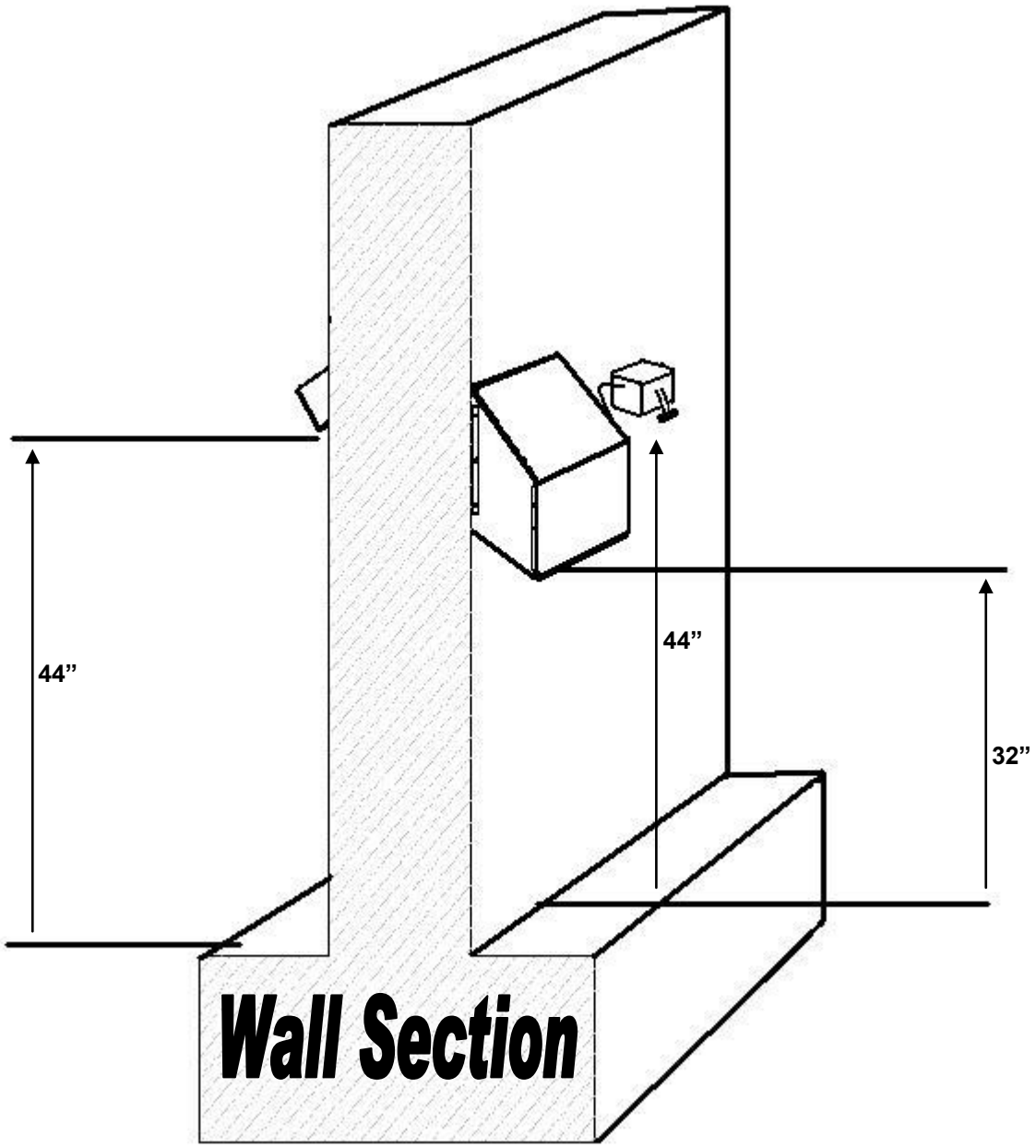


Figure 6.

Figure 6. Assembled Illustration showing heights

Figure 6. Completed Installation

WARRANTY INFORMATION for LIBRARY PRODUCTS

Effective January 1, 2009

Parts and Workmanship

All Kingsley library products have a **ONE YEAR LIMITED WARRANTY** on parts and workmanship. If any Kingsley product should fail during the initial Warranty Period, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect, alterations, vandalism, collision, Acts of God (flood, high winds, hail, etc), normal wear and tear, or uses other than intended.

Powder Coated Finishes:

All Kingsley library products with powder coated finishes have a **LIMITED SEVEN (7) YEAR WARRANTY AGAINST RUST THROUGH** in addition to the Parts and Workmanship Limited Warranty. If any Kingsley Powder Coated product should fail during the initial Warranty Period for the specific problem stated, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect (including failure to recoat scratches), alterations, vandalism, collision, Acts of God (flood, high winds, hail, etc), normal wear and tear, or uses other than intended. "Rust Through" is defined as rust that has formed an opening completely through the metal.

XtremeStainless® Finishes:

All Kingsley library products with Kingsley's XtremeStainless powder coated system have a **LIMITED TWENTY FIVE (25) YEAR WARRANTY AGAINST RUST THROUGH** in addition to the Parts and Workmanship Limited Warranty. If any Kingsley XtremeStainless® product should fail during the initial Warranty Period for the specific problem stated, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect (including failure to recoat scratches), alterations, vandalism, collision, Acts of God (flood, high winds, hail, etc), normal wear and tear, or uses other than intended. "Rust Through" is defined as rust that has formed an opening completely through the metal.

WARRANTY INFORMATION for LIBRARY PRODUCTS

Effective January 1, 2009

Stainless Steel or Aluminum Products

All Kingsley library products manufactured from Stainless Steel or Aluminum have a **LIMITED LIFETIME WARRANTY AGAINST RUST THROUGH** in addition to the Parts and Workmanship Limited Warranty. If any Kingsley stainless steel or aluminum product should fail during the initial Warranty Period for the specific problem stated, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect, alterations, vandalism, collision, Acts of God (flood, high winds, hail, etc), normal wear and tear, surface staining, oxidization, or uses other than intended. "Rust Through" is defined as rust that has formed an opening completely through the metal.

Wood Products

All Kingsley library products manufactured from wood or wood byproducts have a **LIMTED TWO (2) YEAR WARRANTY ON PARTS AND WORKMANSHIP** In lieu of the Standard One Year Parts and Workmanship Warranty. If any Kingsley wood product should fail during the initial Warranty Period for the specific problem stated, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect, alterations, vandalism, collision, Acts of God (flood, high winds, hail, etc), fires, normal wear and tear, or uses other than intended.

Book Trucks

All Kingsley Book Trucks have a **LIMITED TEN (10) YEAR WARRANTY AGAINST MANUFACTURING AND WORKMANSHIP DEFECTS.** If any Kingsley Book Truck should fail during the initial Warranty Period, Kingsley, at the Company's sole discretion and expense, will repair, replace, or refund the purchase price.

This Warranty excludes problems caused by any form of abuse, neglect, alterations, vandalism, collision, Acts of God, normal wear and tear, or uses other than intended.

WARRANTY INFORMATION for LIBRARY PRODUCTS

Effective January 1, 2009

These warranties give you specific legal rights, and you may also have other rights which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

THE EXPRESSED WARRANTIES MADE IN THIS WARRANTY ARE EXCLUSIVE AND MAY NOT BE ALTERED, ENLARGED, OR CHANGED BY ANY DISTRIBUTOR, DEALER OR OTHER PERSON WHATSOEVER. ALL IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY, ARE HEREBY LIMITED IN DURATION TO THE PERIOD FOR WHICH EACH WARRANTY IS GIVEN.

How to obtain Warranty Service:

Contact the Kingsley Customer Care Department:

Email:
info@kingsley.com

Telephone:
909-445-1240 Ext 121

Mail:
Kingsley Customer Care
813 Towne Center Dr
Pomona, CA 91767

Complete Warranty information is available at: www.kingsley.com/warranty

You may be required to provide product serial numbers (located on most products), photographs of the affected area, and a written explanation of the problems you are experiencing.

813 TOWNE CENTER DRIVE, POMONA, CALIFORNIA 91767
(909) 445-1240 • (800) 376-7209 • FAX (909) 445-1250
EMAIL dropbox@kingsley.com • **WEB SITE** www.kingsley.com

CARING FOR YOUR KINGSLEY RETURN

Your new Kingsley return has been manufactured under exacting quality control procedures to provide years of trouble free operation with a minimum of maintenance. Following is a list of routine maintenance items and their schedules that will keep your Kingsley return looking new and trouble-free:

Appearance:

- **Painted Steel:**
  - Kingsley uses a high-grade automotive finish on the majority of our units (some units use a powder coated finish; care instructions below).
    - Units should be washed with a mild detergent and water on a regular basis. Harsh chemicals or abrasives should never be used as they might harm the finish.
    - Once a year, the units should be polished with a regular automotive polish. When water does not "bead" on the surface it is time for a polish application.
  - Scratches should be touched up immediately as rust can form on bare metal. Kingsley has touch-up paints available to match the finish of your return. If you do not have touch-up paint available, use a primer and brush it into the scratch. Any protection is better than no protection at all.
- **Powder-Coated Finishes:**
  - Powder coated finishes need regular washing with a mild detergent and water to retain their new appearance. Polishing is usually not necessary.
  - As with "Painted Steel" above, scratches should be attended to immediately.
- **Standard Stainless Steel Finishes:**
  - Kingsley's Standard Stainless Steel Finish will maintain its new appearance for years with regular maintenance. It should be noted that stainless steel will discolor if exposed to corrosive environments including high salt content (coastal areas) and road chemicals. UNITS MUST BE REGULARLY WASHED WITH A MILD DETERGENT AND WATER. Never use harsh chemicals or abrasives on stainless steel, as they will remove the natural-forming barrier "skin" that makes stainless steel "stainless". A commercial grade stainless steel cleaner should be used to clean the unit between washings following the instructions on the label.
  - Once stainless steel is scratched or dented, there is no way to repair it. Additional washings will help to keep discoloring from forming.
  - Note: The discoloring, usually a rust color, is only discoloration. Units will probably never "rust through" or corrode.

Moving Parts:

- Doors, drawers, casters and all other moving parts should be oiled regularly using a lightweight machine oil (3in1™ or like).

SECTION 09250 - GYPSUM DRYWALL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Extent of each type of gypsum drywall construction required is indicated on Drawings.

B. This Section includes the following types of gypsum board construction:

Gypsum board screw-attached to steel framing and furring members.
Gypsum backing board for application of other finishes.
Glass mesh mortar units for application of tile.
Glass mesh mortar units for application of tile are specified in Division-9 Section "Tile."

1.03 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.

1.04 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide materials and construction which are identical to those of assemblies whose fire resistance rating has been determined per

B. ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

C. Provide fire-resistance-rated assemblies identical to those indicated by reference to GA File No's. in GA-600 "Fire Resistance Design Manual" or to design designations in U.L. "Fire Resistance Directory" or in listing of other testing and agencies acceptable to authorities having jurisdiction.

D. Single-Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.

1.05 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.

1.06 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. 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

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:

Gypsum Boards and Related Products:
Georgia-Pacific Corp.
Gold Bond Building Products Div., National Gypsum Co.
United States Gypsum Co.

2.02 STEEL FRAMING FOR WALLS AND PARTITIONS

A. Steel Studs and Runners: ASTM C 645, 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:

Thickness: 0.0179 inch, unless otherwise indicated.
Depth: 3-5/8 inches, unless otherwise indicated.

B. Steel Rigid Furring Members: ASTM C 645, depth and minimum thickness of base (uncoated) metal as follows:

Depth: 1-1/2 inch.
Thickness: 0.0179 inch, unless otherwise indicated.

C. Z-Furring Members: Manufacturer's standard zee-shaped furring members with slotted or nonslotted 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 inches, wall-attachment flange of 7/8 inch, and of 1-1/2 inches in depth.

D. 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.

2.03 GYPSUM BOARD

A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end joints.

B. Thickness: Provide gypsum board in thicknesses indicated, or if not otherwise indicated, 5/8 inch thicknesses to comply with ASTM C 840 for application system and support spacing indicated.

C. Gypsum Wallboard: ASTM C 36, and as follows:

1. Type: Regular, unless otherwise indicated.
2. Type: Type X for fire-resistance-rated assemblies.
3. Type: Water-Resistant where indicated.
4. Type: Acoustically Enhanced gypsum board where indicated.

4. Edges: Tapered.
5. Thickness: 5/8 inch where indicated.

D. Products: Subject to compliance with requirements, provide one of the following products where Type X gypsum wallboard is indicated:

1. "Gyprock Fireguard 'C' Gypsum Board"; Domtar Gypsum Co.
2. "Fire-Shield G"; Gold Bond Building Products Div., National Gypsum Co.
3. "SHEETROCK Brand FIRECODE 'C' Gypsum Panels"; United States Gypsum Co.

E. Water-Resistant Gypsum Backing Board: ASTM C 630, and as follows:

1. Type: Regular, unless otherwise indicated.
2. Thickness: 5/8 inch where indicated.

F. Acoustically Enhanced Gypsum Board

1. Type: Gold Bond SoundBreak Gypsum Board, National Gypsum Co.
2. Thickness: 5/8 inch where indicated.

2.04 GLASS MESH MORTAR UNITS

A. Proprietary backing units with glass mesh fiber mesh reinforcing and water resistant coating on both faces, complying with one of the following requirements:

B. Cement-Coated Portland Cement Panels: High density portland cement surface coating on both faces and lightweight concrete core composed of portland cement and expanded ceramic aggregate; fabricated in panels 7/16 inch thick by 36 inches wide by 36, 48, or 60, 64, or 72 inches long; and weighing 3.2 - 3.8 lbs per sq. ft.

C. Vinyl-Coated Portland Cement Panels: Core formed in a continuous process from aggregated portland cement slurry and reinforced with vinyl-coated woven glass fiber mesh embedded in both surfaces, with one face smooth and other textured; fabricated in panels 1/2 inch thick and by 36 inches wide by 48, 60, and 72 inches long; and weighing 3 lbs per sq. ft.

D. Products: Subject to compliance with requirements, provide one of the following products to be used in all shower/bath locations and where noted:

1. "Wonder-Board"; Modulars Inc.
2. "Durock Tile Backer Board"; Durabond Div., USG Industries, Inc.

2.05 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:

B. Material: Formed metal, plastic or metal combined with paper, with metal complying with the following requirement:

C. Sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum.

D. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:

1. "LC" Bead, unless otherwise indicated.
2. "LK" Bead with square nose for use with kerfed jambs.
3. "L" Bead where necessary.

2.06 GYPSUM BOARD JOINT TREATMENT MATERIALS

A. 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.

C. Drying-Type Joint Compounds: Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.

D. Ready-Mix Formulation: Factory-premixed product.

E. All-purpose compound formulated for use as both taping and topping compound.

2.07 MISCELLANEOUS MATERIALS

A. 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.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 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. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.

C. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24 inches.

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 boards 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 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. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories.

K. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are braced internally.

L. Except where concealed application is indicated or required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75 percent of full coverage.

M. Fit gypsum board around ducts, pipes, and conduits.

N. Where partitions intersect open concrete coffers, cut gypsum board to fit profile of coffers and allow 1/4 to 1/2 inch wide joint for sealant.

O. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4 inch to 1/2 inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.

P. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.03 METHODS OF GYPSUM BOARD APPLICATION

A. Single-Layer Application: Install gypsum wallboard as follows:

On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.

B. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated, and provide sheet lengths which will minimize end joints.

C. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.

D. On Z-furring members apply gypsum board vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

E. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:

Fasten with screws.

3.04 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, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.

D. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.

E. Install "LK" bead where substrate is kerfed to receive long flange of trim.

F. Install "L" bead where edge trim can only be installed after gypsum board is installed.

G. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

3.05 FINISHING OF DRYWALL

A. General: Apply joint treatment at 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 compound.

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: Ready-mixed drying-type all-purpose or taping compound.
2. Fill (Second) Coat: Ready-mixed drying-type all-purpose or taping compound.
3. Finish (Third) Coat: Ready-mixed drying-type all-purpose or taping compound.

E. Partial Finishing: Omit third coat and sanding on concealed drywall construction which is indicated for drywall finishing or which requires finishing to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

3.06 APPLICATION OF SMOOTH FINISH

A. Surface Preparation and Primer: Prepare and prime drywall and other surfaces in strict accordance with texture finish manufacturer's instructions. Apply primer to all surfaces to achieve smooth finish.

B. Finish Application: Mix and apply finish to drywall and other surfaces indicated to receive finish in strict accordance with manufacturer's instructions to produce a uniform smooth finish without evidence of thin application, and free of application patterns.

C. Drywall texture: All gypsum board shall receive smooth finish, with a **LEVEL 5 FINISH**

D. Remove any droppings or laitance from door frames, windows and other adjoining construction.

3.07 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 09286 GLASS-MAT FACED GYPSUM BACKING BOARDS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Fiberglass-mat faced, moisture resistant gypsum backer board.

B. Related Sections:

1. Section 09216 Gypsum Board Assemblies.

C. Allowances:

D. Unit Prices:

E. Alternates:

1.02 REFERENCES

A. ASTM International (ASTM):
1. ASTM C627 Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester.
2. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board.
3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
4. ASTM C1178 Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel.
5. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
6. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

1.03 SUBMITTALS

A. Product Data: Manufacturer's specifications and installation instructions for each product specified.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Georgia-Pacific Gypsum LLC:
2. Fiberglass-Mat Faced Gypsum Backing Board: 1/2 inch DensShield.

2.02 MATERIALS

A. Fiberglass-Mat Faced Gypsum Backing Board: ASTM C1178
1. Thickness: 1/2 inch.
2. Width: 4 feet.
3. Length: 8 feet.
4. Weight: 2600 pounds per M square feet.
5. Edges: Square.
6. Surfacing: Coated fiberglass mat on face, back, and long edges.
7. Mold Resistance (ASTM D3273): Not less than 10, in a test as manufactured.
8. Permeance (ASTM E96): Not more than 1.0 perms when tiled.
9. Robinson Floor Test Rating (ASTM C627): Light commercial.

10. Acceptable Products:
    a. 1/2 inch DensShield Fireguard Type X, Georgia-Pacific Gypsum.

2.03 ACCESSORIES

A. Screws: ASTM C1002, with corrosion resistant treatment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, to begin installation of work of this section.

3.02 INSTALLATION

A. General: In accordance with ASTM C840 and the manufacturer's recommendations.

   1. Manufacturer's Recommendations:
      a. Current "Product Catalog", Georgia-Pacific Gypsum.

3.03 PROTECTION

A. Protect gypsum board installations from damage and deterioration until the date of Substantial Completion.

END OF SECTION

SECTION 09300 – CERAMIC TILE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, tools, equipment and services necessary for and reasonably incidental to complete the tile work as shown on the drawings or specified.

B. Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

C. Related Sections:

1. Division 7, sealing expansion joints and other joints in tile work (joint sealant types, colors and manufacturers to be specified by Architect). 07920

2. Division 3, Concrete. 03300

1.2 REFERENCE STANDARDS

A. Comply with current editions and applicable Specifications of the following:

1. American Society for Testing and Materials (ASTM).

2. American National Standards Institute (ANSI).

3. Tile Council of America (TCA) Handbook for Ceramic Tile Installation.

1.3 QUALITY ASSURANCE

A. Provide tile materials of each type, color and finish from Provide setting, grouting and related materials of each type, color and finish obtained from one source.

B. Deliver, store and handle materials in accordance with manufacturer's instructions.

C. Tile contractor, by commencing the work of this section, assumes overall responsibility to assure that all assemblies, components and parts shown or required within the work of this section comply with contract documents and are compatible with each other and with the conditions and expected use.

D. Installer Qualification: Engage an installer with a minimum of five (5) commercial tile installations similar in material, design and scope to that indicated.

E. Pre-Installation Meeting: Prior to tile installation, conduct a pre-installation project

meeting. Contractor, Subcontractor, Material Suppliers, Architect and Owner representative shall be notified of the meeting.

F. Field Mock-Up: Install a fully finished mock-up for each type tile installation. Mock-up shall be a minimum of 10'0" x 10'0" and will be reviewed for joint quality, color range, pattern and workmanship.

G. Extra Stock: Furnish extra stock of quantity equal to 5 % of amount installed, in full-size units, for each type, color, size and finish of tile.

1.4 SUBMITTALS

A. Verification Samples: Submit the following for each type, color, size, and finish included in the work.

1. Full size tile and trim shapes, (2).

2. Grout color samples.

3. Sealant color samples or Prefabricated Joint/Transition Strip Samples

B. Product and Installation Data:

1. Porcelain tile manufacturer's product and technical data indicating compliance with applicable standards.

2. Master Grade Certificates for each type of tile issued by tile manufacturer and signed by the installer.

3. Mortar and grout manufacturer's technical data sheets indicating suitability for the installation specified and compliance with applicable standards.

4. Sealant or prefabricated joint manufacturer's product and technical data.

1.5 ENVIRONMENTAL

A. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during and after installation.

B. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

C. Maintain minimum and maximum temperature limits as recommended by manufacturers.

D. Protect adjacent surfaces during progress of the work in this section.

E. Illuminate the work area during installation providing the same level and angle of illumination as will be available for final inspection.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Furnish tile complying with "Standard Grade" requirements per ANSI A137.1 – 1988, for types of tile indicated.

B. Comply with ANSI Standard for Tile Installation Material and current Tile Council of America Handbook for products and materials indicated for setting and grouting.

2.2 TILE

A. Unglazed and glazed porcelain tile shall be conform to the requirements of ANSI A137.1 – 1988.

1. Size: Porcelain and ceramic tile shall be manufactured to specific size after firing and shall be Nominal (see corresponding chart below). All measurements are in inches unless otherwise specified.

* Denotes mounted mosaics, refer to manufacturer's literature for specific dimensions of mounted sheet.

Nominal	Actual
*1 x 1 x 5/16	1 ¼ x 1 ¼ x 5/16
1 x 1 x 3/8	1 x 1 x 3/8
*1 x 2 x 5/16	1 ¼ x 2 5/8 x 5/16
*1 x 3 x 5/16	1 ¼ x 4 x 5/16
*2 x 2 x 3/8	2 ¼ x 2 ¼ x 3/8
*3 x 3 x 3/8	2 ¾ x 2 ¾ x 3/8
*3 x 3 x 1/4	2 7/8 x 2 7/8 x ¼
3 x 6 x 3/8	3 x 6 x 3/8
3 x 6 x 3/8	2 ¾ x 5 5/8 x 3/8
3 x 6 x 3/8	2 7/8 x 5 ¾ x 3/8
3 x 12 x 3/8	2 7/8 x 11 ¾ x 3/8
*4 x4 x 3/8	3 ¾ x 3 ¾ x 3/8
4 ½ x 4 ½ x 3/8	4 ½ x 4 ½ x 3/8
4 x 8 x 3/8	3 ¾ x 7 ¾ x 3/8
6 x 6 x 5/16	5 ¾ x 5 ¾ x 5/16
6 x 6 x 3/8	5 ¾ x 5 ¾ x 3/8
6 x 6 x 3/8	6 x 6 x 3/8
6 ½ x 6 ½ x 3/8	6 ½ x 6 ½ x 3/8

6 x 12 x 5/16	5 ¾ x 11 ¾ x5/16
6 x 12 x 3/8	5 ¾ x 11 ¾ x 3/8
6 x 24 x 3/8	5 ¾ x 23 7/8 x 3/8
7 x 7 x 5/16	6 ¾ x 6 ¾ x 5/16
8 x 8 x 5/16	7 ¾ x 7 ¾ x5/16
8 x 8 x 3/8	7 ¾ x 7 ¾ x 3/8
8 x 12 x 5/16	7 ¾ x 11 ¾ x 5/16
8 x 13 x 5/16	7 7/8 x 13 1/8 x 5/16
12 x 12 x 1/4	11 7/8 x 11 7/8 x ¼
12 x 12 x 5/16	11 ¾ x 11 ¾ x 5/16
12 x 12 x 3/8	11 ¾ x 11 ¾ x 3/8
12 x 12 x 3/8	12 ¼ x 12 ¼ x 3/8
12 x 18 x 3/8	11 ¾ x 17 ¾ x 3/8
12 x 18 x 3/8	12 ¼ x 18 3/8 x 3/8
12 x 24 x 3/8	11 ¾ x 23 7/8 x 3/8
12 x 24 x ½	11 ¾ x 23 ½ x ½
13 x 13 x 5/16	13 1/8 x 13 1/8 x 5/16
13 x 13 x 3/8	13 x 13 x 3/8
14 x 14 x 5/16	13 5/8 x 13 5/8 x 5/16
14 x 28 x3/8	13 5/8 x 27 ¼ x 3/8
16 x 16 x 3/8	15 ¾ x 15 ¾ x 3/8
18 x 18 x 3/8	17 ½ x 17 ½ x 3/8
18 x 18 x 3/8	17 ¾ x 17 ¾ x 3/8
18 x 18 x 3/8	18 3/8 x 18 3/8 x 3/8
20 x 20 x 3/8	19 ½ x 19 ½ x 3/8
24 x 24 x ½	23 ½ x 23 ½ x ½

2. Type: Porcelain tile shall be see finish schedule

3. Thickness: Porcelain tile shall be manufactured to specific thickness after firing and shall be nominal.

4. Product Test Data:

   a. Water Absorption (ASTM C373): .5%.

   b. Abrasive Wear Resistance (ASTM C501)

   c. Breaking Strength (ASTM C648): 250 psi or greater.

   d. Bond Strength (ASTM C482): 50psi.

   e. Coefficient of Friction (ASTM C1028): ADA standard > .6.

   f. Chemical Resistance: (ASTM C-650-04) 10% HCL Acid - 10% KOH Alkali

6. According to availability, provide matching trim shapes such as bullnose, corners, borders and cove base when specified.

2.3 SETTING AND GROUTING MATERIALS:

A. Use appropriate installation mortars according to ANSI A118-1999 series or A136.1-1999.

B. Use grout per ANSI A118.3, A118.5, A118.6 A118.7 or A118.8-1999.

C. Use waterproofing/Anti Fracture Membrane as required according to ANSI A118.10-1999.

2.4 EXPANSION JOINTS, CONTROL, CONTRACTION, AND ISOLATION JOINTS:

A. Refer to most current TCA Handbook, Method EJ171-YY (Year) for recommendations on locating, treating and detailing various types of construction joints. NOTE: Architect must specify type of expansion joints and show location and details on drawings.

B. Use sealant complying with ASTM C920 according to Type, Grade, Class and Uses required.

C. Provide marble threshold trim strips or other edging material where tile terminates at dissimilar finishes as shown or specified.

D. Prefabricated expansion joints can also be used when suitable for installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates where tile will be installed for compliance with requirements for installation tolerances and other conditions effecting performance of installed tile. Verify that substrates for setting tile are well cured, structurally sound dry,
clean, and free from oil or waxy films, curing compounds or other coatings and surface treatments.

B. Do not proceed with installation until unsatisfactory conditions have been corrected. Commencement of work signifies acceptance of substrate and installation conditions.

3.2 PREPARATION

A. Substrate Preparation: Prepare and clean substrate in accordance with installation standards and manufacturer's instructions, and as follows:

1. Remove protrusions, bumps and ridges by grinding or chipping.

2. Repair, fill, and level cracks, holes, depressions and rough or chipped areas in substrate using patching material recommended by setting materials manufacturer.

3. Slab to have light broom finish when tile is installed by thin-set method.

4. Ensure that the substrate is within the following tolerances:

   a. Horizontal surfaces (floors) - Maximum variation in substrate shall not exceed ¼ " in ten feet* from required plane, depending on substrate.

   b. Vertical surfaces (walls) - Maximum variation in substrate shall not exceed ¼ " in ten feet* from the required plane, depending on substrate.

   * When using tile larger than 12"x12" and a grout joint narrower than ¼"is desired a more stringent tolerance(e.g.,1/8 " in 10'), should be considered.

B. Jobsite Blending: Blend tiles before installing in accordance with reference standards to produce an even range and distribution of color and finish.

3.3 INSTALLATION

A. Manufacturers' Instructions: Perform work in compliance with standard accepted installation guidelines, Crossville Porcelain Stone/USA instructions and setting materials manufacturers' instructions.

B. General Installation Standards: Install tile in accordance with ANSI A108 standards, appropriate TCA methods, and written instructions of the specified manufacturers.

1. Thin-set Floor Installations: TCA Method F.
2. Thin-set Wall Installations: TCA Method W.
3. Thick Set Floor Installations: TCA Method F.
4. Thick Set Wall Installations: TCA Method W.

C. Installing Tile:

1. Install tile in pattern indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Adjust to minimize tile cutting and to avoid tile less than half size.

2. When possible, smooth cut edges of tile and/or use appropriate cutter or wet saw to produce smooth cuts. Provide straight cuts which align with adjacent materials.

3. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruption.

4. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.

5. Provide tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints smooth and even, without voids, cracks, or excess mortar or grout.

6. Mix mortar in strict accordance with manufacturer's recommendations.

7. Apply setting material in accordance with manufacturer's directions and install tile before mortar has started initial cure. For thin set mortar application, use a notch trowel that will achieve the recommended coverage of mortar after tiles have been installed. Reference standard coverage information and follow manufacturer's recommendations for trowel size when using mortar.

8. Do not spread more material than can be covered within 10 to 15 minutes. If "skinning" occurs, remove mortar and spread fresh material. Spread mortar with notches running in one direction that shall be perpendicular to the pressing, pushing and pulling of tile during placement.

9. Place tile in fresh mortar, press, push and pull the tile slightly to achieve as near 100% coverage and contact of tile with setting material and substrate as possible. The coverage shall be no less than 85% and be sufficiently distributed to give full support of the tile. Make sure that all corners and edges are well supported with mortar. Leave no hollow corners or edges. NOTE: 95-100% coverage is mandatory for wet or exterior areas. A skim coat ("back-butter") of mortar can be placed onto the entire back of the tile using a trowel in order to assist in optimum adhesion and coverage of the mortar being used.

10. Ensure there is a minimum 1/8" of mortar between tile and substrate after proper bedding. Installer must periodically remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications. If coverage is found to be insufficient, use a larger size notch trowel.

11. Use a beating block and hammer or rubber mallet so that faces and edges of individual tiles are flush and level with faces and edges of adjacent tiles, and to reduce lippage.

D. Grouting:

1. Install grout in accordance with ANSI A108.10, A108.6, A108.8, A108.9-1999 correlating to grout type chosen and manufacturer's recommendations.

2. Mix grout material in strict accordance with manufacturer's directions.

3. Apply grout to produce full, smooth grout joints of uniform width, and free of voids and gaps.

4. Before grouting entire area do a test area to assure there will be no permanent staining or discoloration of the tile and to verify that the grout is easily removed from the surface. If necessary, pre-coat exposed surfaces of tile with a grout release as recommended by the manufacturer, as this will facilitate removal of the grout.

5. Cure all setting and grouting materials in accordance with manufacturer's recommendations.

E. Cleaning and Protection:

1. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter, in accordance with manufacturer's instructions. If a grout haze or residue remains, use a suitable grout haze remover or cleaner and contact grout manufacturer for recommendations. Flush surface with clean water before and after cleaning. Do not use harsh hydrochloric, muriatic or sulfuric acid or acid-based cleaners to clean glazed tiles or tiles grouted with latex modified grout.

2. When a heavy residue of Portland cement grout is present, acceptable tile cleaning acids may be used. However, the grout should be allowed to cure a minimum of 10 days before this aggressive cleaning method is employed. Tile and grout shall be soaked with water before cleaning. In the absence of a recommendation from the grout manufacturer, acid cleaning may be done with a saturated solution of phosphoric or sulfamic acid, mixed in accordance with manufacturer's recommendations.

3. After cleaning, provide protective covering and maintain conditions to protect tile work from damage or deterioration. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, and during move-in of furniture and equipment, cover protective covering with 1/4" hardboard, plywood or similar material.

4. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

5. Consult most current Crossville Brochure "How to Care For Porcelain Tile" for information on post installation cleanup and routine maintenance

END OF SECTION

SECTION 09510 CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Acoustical ceiling panels.
   2. Exposed grid suspension system.
   3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:
   1. Section 01350, Special Environmental Requirements
   2. Section 09250 - Gypsum Board
   3. Division 15 Sections - Mechanical Work
   4. Division 16 Sections - Electrical Work

C. Alternates
   1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.
   2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
10. ASTM E 1264 Classification for Acoustical Ceiling Products.
11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
    a. Flame Spread: 25 or less
    b. Smoke Developed: 50 or less

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 PROJECT CONDITIONS

A. Space Enclosure:
All ceiling products and suspension systems must be installed and maintained in accordance with Armstrong written installation instructions for that product in effect at the time of installation and best industry practice. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32oF (0o C) and 120oF (49o C) and not subject to Abnormal Conditions. Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust buildup. HumiGuard Plus Ceilings: Installation of the products shall be carried out where the temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry. The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.

1.8 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
    1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
    2. Grid System: Rusting and manufacturer's defects
    3. Acoustical Panels with BioBlock Plus or designated as inherently resistive to the growth of micro-organisms installed with Armstrong suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
B. Warranty Period Humiguard:
    1. Acoustical panels: Ten (10) years from date of substantial completion.
    2. Grid: Ten (10) years from date of substantial completion.
    3. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is thirty (30) years from date of substantial completion.
C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.
   2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

Part 2-PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:
   1. Basis of design is Armstrong World Industries, Inc.

2.2.0 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type ACT-1:
   1. Surface Texture: Fine
   2. Composition: Mineral Fiber
   3. Color: White
   4. Size: 24in X 24in X 7/8in
   5. Edge Profile: Angled Tegular for interface with Prelude XL 15/16" Exposed Tee.
   6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.70.
   7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 38
   8. Emissions Testing: Section 01350 Protocol, < 13.5 ppb of formaldehyde when used under typical conditions required by ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"
   9. Flame Spread: ASTM E 1264; Class A (UL)
   10. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.86.
   11. Dimensional Stability: HumiGuard Plus - Temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.
   12. Antimicrobial Protection: BioBlock Plus - Resistance against the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
   13. Acceptable Product: Cirrus Tile & Lay-In, 534 as manufactured by Armstrong World Industries.

2.3.0 SUSPENSION SYSTEMS

A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
   1. Structural Classification: ASTM C 635 Intermediate Duty.

2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
3. Acceptable Product: Prelude XL 15/16" Exposed Tee as manufactured by Armstrong World Industries, Inc.

B. High Humidity Finish: Comply with ASTM C 635 requirements for Coating Classification for Severe Environment Performance where high humidity finishes are indicated.
1. SS Prelude Plus by Armstrong World Industries, Inc. - 100% Type 304 STAINLESS Steel.
2. AL Prelude Plus by Armstrong World Industries, Inc. - all ALUMINUM
3. Prelude Plus XL Fire Guard by Armstrong World Industries, Inc., G-60 Hot dipped galvanized /aluminum capping
4. Structural Classification: ASTM C 635 duty class.
5. Color: [Stainless for SS only][White aluminum] [Clear Anodized Aluminum]

C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.

E. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.

F. Accessories

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other sections.
1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.

3.3 INSTALLATION

A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

B. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.

C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

D. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.
B. 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.
    1. Ceiling Touch-Up Paint, (Item #5760, 8oz. bottles) (Item #5761, quart size cans), "global white" latex paint should be used to hide minor scratches and nicks in the surface and to cover field tegularized edges that are exposed to view.
C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09615 – TOILET PARTITIONS

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes: Solid plastic toilet partitions, urinal screens, shower stalls and dressing compartments.

1.02 RELATED SECTIONS

A .Section 10800: Toilet and Bath accessories

1.03 SUBMITTALS

A. Shop Drawings: Layout of toilet partitions.
B. Product Data: Manufacturer's catalog cuts of typical panel, pilaster, door, hardware and fastenings.
C. Color Chips: Manufacturer's complete range of standard colors for solid plastic partitions.
D. Verification Samples" sample of actual specified plastic chip for color and texture verification.

1.04 QUALITY ASSURANCE

A. Components of toilet partitions shall be sourced from one single-source manufacturer who certifies that materials meet or exceed specification.
B. Installation: Installer shall have a history of completed jobs of similar size and scope and shall be qualified.

1.05 DELIVERY, STORAGE AND HANDLING

A. Pre-finished materials shall be delivered to the job site in original unopened cartons or other packaging materials necessary to protect structure and finishes. Materials shall be stored in manufacturer's packaging until installation. Partitions shall be stored in horizontal position with adequate support to ensure flatness and to prevent damage to pre-finished surfaces.

1.06 PROJECT CONDITIONS

A. Building shall be enclosed and provide complete protection from outside weather. Temperature within building shall be above a minimum of 60°F and below 100°F.

1.07 WARRANTY

A. Manufacturer shall provide a 15-year warranty against corrosion, breakage and delamination of plastic material under normal conditions.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. The basis of design is manufactured by The Mills Company, subsidiary of Bradley Corp., Menomonee Falls, WI.

2.02 EQUIPMENT

A. The basis of design is sentinel floor-mounted overhead-braced series 400 toilet partition system.

2.03 COMPONENTS

A. Doors, Panels and Pilasters shall be constructed from High Density Polyethylene (HPDE) resins, pressed under high-pressure, forming a single component. The material shall be waterproof, non-absorbent and have a self-lubricating surface that resists marks from graffiti. All plastic components shall be covered with a protective self-adhesive coating.

1. Door, panel and pilaster shall be 1" thick and have edges rounded to a 3/16" radius.
2. Doors and panels shall be 55" high and mounted at 14" above the finished floor. An aluminum heat sink strip shall be fastened to the bottom edge of doors and panels.
3. Pilasters shall be 82" high and shall be secured to the floor using a 3" high, one-piece, type 304 stainless steel shoe with a #4 satin brushed finish. Headrail of etched and anodized aluminum shall be extruded with "anti-grip" profile clamps over pilasters and shall be secured to the wall with stainless steel brackets.
4. Urinal screens shall have the same construction as doors, panels and pilasters. Urinal screens shall be 42" high and mounted at 18" above the finished floor.

B. Hardware: Mills heavy-duty aluminum hardware and stainless steel fasteners necessary to completed an installation shall be provided.

1. Integral hinge system shall consist of ½" diameter nylon gravity cam unit with a 3/16" stainless steel center pin for the bottom and a ½" nylon rod for the top. The closing position of each hinge shall be fully adjustable.
2. Latches shall be fabricated from heavy-duty extruded aluminum. Slide bolt shall have a black anodized finish. Latch is mounted to the door with stainless steel theft-resistant bolts. Latch shall not require any twisting motion and shall be ADA compliant.
3. Strike/keeper shall be 6" long and fabricated from heavy-duty extruded aluminum with wraparound flanges. Strike/keeper shall be mounted to the pilaster with thru-bolts.
4. Coat hooks, door bumpers, and door pulls shall be provided in a Zamac alloy with a satin finish. Integral hinge doors 32"-36" wide shall be supplied with an individual coat hook, door bumper and door pull.
5. Continuous brackets shall 54" long and shall be fabricated from heavy-duty aluminum. Single- or double-ear brackets shall be provided at appropriate locations.
6. All fasteners shall be stainless steel torx head with pin.

PART 2 - EXECUTION

3.01 INSPECTION

A. Before installation, the installer shall inspect the site to ensure that no defects or conditions exist which would result in an unsatisfactory installation of partition. Measurements should also be taken at this time to further ensure correct installation.

3.02 INSTALLATION

A. Installers must allow 24 hours for material to adjust to the site environment. Banding, stretch wrap and cardboard should be removed.
B. Install partitions, screens, dressing compartments and enclosures in accordance with shop drawings and manufacturer's current installation instructions. Leave compartments complete, clean and free from defects in workmanship.
C. Install panel or locate outswinging doors to prevent their opening more than 105°
D. Doors and hardware shall be thoroughly adjusted and left in proper working condition. Set doors in open or close position as required.

3.03 CLEANING

A. All rubbish and cartons generated by installer shall be removed and the area left broom clean.

END OF SECTION

SECTION 09680 CARPET

PART I – GENERAL

1.01 DESCRIPTION

A. Work under this section consists of furnishing all labor, material, tools, equipment, and carpet accessories needed for a complete proper glue-down installation of carpet or carpet tile as shown on drawings and as specified herein. Work includes removal of existing carpet flooring, surface preparation and repair, wainscoting and carpet base where occurs.

1.02 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

1. The Carpet and Rug Institute "The Carpet Specifier's Handbook" CR104
2. Manufacturer's Maintenance Manual and Installation Instructions

1.03 QUALITY ASSURANCE

A Manufacturer – Carpet manufacturer shall have no less than five (5) years of production experience with carpet similar to type specified in this document; and whose published product literature clearly indicated compliance of products with requirements of this section.

B. Installer Qualifications – Trade contractor must have five (5) years minimum experience in the installation of commercial carpeting in projects of similar size and scope specified herein. Installer must be certified or approved by the carpet manufacturer and certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification requirements.

C. Single Source Responsibility – Provide material produced by a single manufacturer

D. Carpet Performance / Certified Testing –

1. Flammability: Carpet shall meet or exceed the following test results:
   a. DOC FF1 – 70 (Pill Test): Pass
   b. NFPA – 258, ASTM E – 622 (Smoke Density): 450 or less
   c. NBS-1R-75-950, ASTM E648 (Floor Radiant Panel Test): Critical radiant flux, 0.45 watts per square centimeter or higher

2. Static Propensity: AATCC Test Method 134 less than 2.5 KV at 70E and 20% relative humidity

3. Colorfastness:
   a. To Light: AATCC 16E-1982 shade change after 80 standard fading hours shall be not less than 3

b. To Water: AATC-107, Minimum 4

4. Crockfastness: AATCC 8, Wet 4, Dry 4

5. Pile Fuzzing & Piling: DuPont TRL Method 609 minimum acceptable piling rate 4.2 on scale of 1 to 5

6. Tuft Bind: ASTM D-1335 Rating: 10lbs of Force Per Inch Width

7. Dimensional Stability of Modular Carpet:
   Test Method: Physical Measurement
   Rating: within 1/32" of specifications

8. Shrinkage: AATCC Test Method DOC-C-95 maximum average shrinkage acceptable shall be 1 to 3 percent of length and width

9. Delamination Strength: Federal Test Method 191, ASTM D-3936 minimum acceptable strength is 3.5

10. Wear and Appearance Retention: ASTM D5417 (Vitterman Drum Test), 4 to 5
    ASTM D5252 (Hexapod Walker), 4 to 5

11. Indoor Air Quality (IAQ) Pass Green Label Certification tests with VOCs totaling 500 micrograms per square meter per hour or less

12. Soiling Resistance: Test Method : AATCC 189
    Rating: An average of 3 fluorine analyses of a single composite sample to be a minimum of 500 pppm fluorine by weight when new and 400 ppm fluorine by weight after 2 AATCC 171 (HWE) Cleanings.

13. Cleanability and Stain Resistance: Test Method: Red Dye 40 Test / Rating 8 or better

1.04 MEASUREMENTS

Dimensions in the drawings are to be considered as approximates. Contractor shall be required to carefully check in the field all dimensions and other conditions affecting his work. The Contractor will be held solely responsible for proper installation of the carpet in all areas designated. Contractor shall be responsible for providing all carpeting required under his contract.

1.05 SUBMITTALS

A. Substitutions

1. All substitutions must conform to the criteria below and be approved by architect the 14 days prior to the bid. Bids with unapproved alternates will be rejected wholly. This

will include "Value Engineered" substitutions that are part of a bid that contains pricing on specified products.

2. All substitutions must confirm to the physical specification in this document. (See material section 2.01) The architect will however, reserve the right to reject alternates based solely on aesthetic values.

3. If approved, the contractor must provide an additional 10% of materials above those outlined in section 3.09 for future maintenance.

B. Shop Drawings: Within fourteen (14) Calendar days after the Contractor has received Architect's Notice to proceed seaming diagram must be submitted to the architect for approval prior to the ordering of material.

1. The layout shall make the most effective use of widths and lengths available and shall minimize waste and seams. Indicate direction of pattern. Direction of carpet must be approved.

2. Indicate seam location, edge strip types and locations and method of joining seams where possible and practical. Locate seams in areas of least amount of traffic. Seams shall not be placed perpendicular to door openings. If any exceptions are taken, note these exceptions on the seaming diagrams. Seams occurring parallel to doors shall be centered directly under the door.

3. Show relationship to related work such as thresholds, reducers, expansion joints, bases, etc. Refer to related Contract Documents for construction of areas to receive carpet and verify that conditions shown and specified remain unchanged at time of shop drawing preparation. If changes have been ordered, show revised conditions.

C. Product Data to be submitted are as follows:

1. Carpet Manufacturer's printed literature, specifications and installation instructions for carpeting material, seaming system, adhesive and installation accessories required and other data required to prove compliance with the Contract Documents including written data on physical characteristics, durability, resistance to fading and flame resistance characteristics. Carpet manufacturer's recommend installation procedures, when approved by the Architect, shall become the basis for accepting or rejecting actual installation procedures and used on the work.

2. Maintenance Instructions:

a. Provide two copies of the carpet manufacturer's detailed maintenance recommendations for the care, cleaning, and repair of the carpets installed under this Contract, including stain removal products and procedures, manufacturer's

recommend maintenance schedule and precautions for cleaning materials and methods that could be detrimental to the carpet.

b. Provide from carpet manufacturer a written commitment and enrollment for certified maintenance training for maintenance personnel.

D. Carpet Samples and Accessories

1. Prior to carpet production, submit one 9"x9" carpet sample of each type, color and pattern specified and test results verifying compliance to the specifications and obtain written approval of the Architect.

2. All carpet tests shall be performed by an independent test laboratory designated by the architect or manufacturer. All test will be part of the incidental work included with this contract.

3. Immediately prior to installation, submit one additional finished carpet sample of each type, color and pattern specified to Architect and obtain written approval of Architect. The Architect will exercise sole authority for determining conformance of the carpet with the specified requirements in color, pattern, type, strength and durability..

4. Submit 4" long samples of each type of exposed edge stripping and other accessories.

E. CERTIFICATES

1. Provide manufacturer's certificates of compliance stating that each material delivered conforms to specified requirements.

2. Submit certified laboratory test reports for carpet performance as listed under Quality Assurance. Tests shall be performed by an independent test laboratory designated by the City. All tests will be part of the incident work included with this contract.

3. Provide manufacturer's certification that carpet has been installed as specified in accordance with manufacturer's installation recommendations.

4. Submit letter from manufacturer certifying acceptability of installer and suitability of adhesive to installation conditions.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver carpet in original mill protective wrapping clearly marked with manufacturer's labels indicating size, dye lot, quality and registration numbers.

B. Use all means necessary to protect carpeting materials before, during and after installation and to protect the existing premises.

C. Carpet shall be stored at Contractor's expense in a warehouse capable of storing carpet in a manner that will not damage the carpet or shorten its useful life.

D. In the event of damage, immediately make all repairs and replacements necessary to the satisfaction of the Architect at no cost to the City and County of San Francisco.

E. Deliver to site only the amount of carpet that will be installed each day.

1.07 GUARANTEE AND FORM OF GUARANTEE

A. Warranties

1. General: The manufacturer shall supply unrestricted, full replacement non-prorated warranties as listed below.
2. Wear: no more than 10% yarn loss by weight for a minimum of 15years of carpet normal use.
3. Edge Ravel: Guaranteed no edge ravel in normal use for a minimum of 15 years of normal carpet use.
4. Tuft Bind: Guaranteed not to zipper for a minimum of 15 years of normal carpet use.
5. Delamination: Primary and secondary backings guaranteed not to delaminate for a minimum of 15 years of normal carpet use.

PART 2 - PRODUCTS

2.01 MATERIALS (Basis of Design)

A. General: Carpet shall be mothproof, mildew-proof, and treated to prevent attack by carpet beetles and shall meet all applicable industry standards and code requirements or flammability. Carpet shall be first quality,suitable for heavy commercial use, and shall be free of irregularities in weave, materials, and color.

B. Carpet Specification:

1.The specification below shall be used as a **guide** to establish the **performance and aesthetic quality** of the carpet in the colors and patterns specified. All the carpet for the installation shall be made by the same mill at the same time.

a. Broadloom Basis of Design (**Carpet One**)

` Style Lees Realization with 108 Grey Dawn

A. Construction: tufted textured patterned loop
B. Yarn: Invista Antron Legacy, type 6,6, No Substitutions
C. Gauge: 12th
D. Dye Method: 100% yarn dyed
E. Pile Weight: 26oz per sqyd; measured according to ASTM D-5848
F. Stitches: 11.6 per inch minimum measured according to ASTM D-5793
G. Pile Height: 0.83" minimum measured according to ASTM D-6859

H. Primary Backing: Woven Polypropylene
I. Secondary Backing: Unibond
J. Stain Resistance Treatment: Duratech/ Dura Color by Lees
K. Moisture Penetration: Impermeable

b. Carpet Tile Entryway Basis of Design (**Carpet Three**)
Style Lees First Step Modular Tuff Stuff 524 Stepping Stone

A. Construction; Tufted
B. Yarn; Fortis Nylon 6,6 with Nylon 6,6 Scraper Yarn
C. Gauge; 5/32"
D. Stitches Per Inch; 8.5 per Inch
E. Pile Weight; 38oz/sqyd, Measured According to ASTM D-5848
F. Stitches Per Inch; 8.5 per inc, Measured According to ASTM D-5793
G. Pile Height; .249 Inch, Minimum Measured According to ASTM D-6859
H. Backing Material; ICT-Fiberglass Reinforced Thermoplastic Composite
I. 24"x 24" Carpet Tile

C. Architect reserves the right to make final adjustments in carpet colors after the award of bid upon reviewing samples.

D. Adhesives/ Seam Sealers:

1. Provide highest quality adhesive/ Seam sealers as recommended by carpet manufacturer for intended use condition; No Substitutions

E. Floor Filter: Ardex Feather finish or equal.

F. Accessories:

1. Binder Bar: Stainless steel installed as required and approved by the Architects.
2. Carpet reducers for heavy-duty use. Verify size of carpet for transition sizing.
3. Carpet Edgings: Metal and resilient material to match existing, colors to be selected by Architect.

Do not use snap down dividers or edgings.

G. Provide other materials, not specifically described nut required for a complete and proper installation, as approved by the Architect.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine surfaces scheduled to receive carpeting for holes, debris or other defects that will adversely affect execution and quality of work. Verify that subfloors receiving carpeting are smooth and meet minimum requirements established by carpet manufacturer. As soon as removal of existing carpet

is done in area to receive new carpeting, inspect such surfaces with the Architect. No increase in the Contract Price will be allowed for restoring surfaces to quality required for installation of scheduled carpeting.

B. Do not start work until unsatisfactory conditions are corrected.

3.02 DEMOLITION

Contractor must provide certification of recycling. No carpet may be directed to landfill or dump sites. Manufacturing will provide a list of acceptable recycling procedures.

A. Remove only sections of carpet flooring, wall carpet and carpet base to be immediately replaced in each area.

B. Remove only sections of carpet flooring, wall carpet and carpet base to be immediately replaced in each area.

C. Remove material shall be considered to be property of the Contractor and shall Be completely removed from the site.

D. Damage to material and finishes caused by movement of equipment or other operations during construction shall be restored or replaced at no additional cost to the client. Restoration shall be equal to the original work and finishes shall match the appearance of existing adjacent work.

E. Use methods necessary to prevent dust from becoming a nuisance to the public, to tenants and to other work being performed on or near the site. Vacuum carpet before removal to minimize dust during demolition.

F. In the event of removal of items not so scheduled to be removed, promptly replace such items to the approval of the Architect and at no additional cost to the client.

G. Contractor shall verify existing conditions especially conditions related to the removal of existing carpet. Removal may be more difficult than other regular carpet instillation.

3.03 SURFACE PREPARATION

A. General: Comply with CR104, Section 6.2, “Site Conditions: Floor Preparations,” and carpet manufacturer’s written installation instructions for preparing substrates indicating carpet installation.

B. Subfloor shall be thoroughly cleaned before carpeting is laid.

1. Remove all dust, dirt, solvent, oil, grease, paint, plaster wax and other substances which would be detrimental to the proper performance of adhesive carpet. Allow floors to dry thoroughly.

2. Ensure that subfloors are free from scaling and irregularities and exhibit neutral reality relative to acidity and alkalinity.

3. Ramping: Where carpet terminates alt levels below abutting finish floors, ramp, up

using sub-floor filler as required to provide a smooth transition. Top of carpet shall be ¼ inch above adjacent floor surface. Where applicable, ramp-up at carpet transitions near elevators, escalators and expansion joint covers where existing edge strip show evidence of buckling and excessive wear and tear.

C. Protrusions or low spots shall be sanded or filled, as needed, to achieve a smooth and level Surface.

D. Existing floor surfaces shall be prepared to receive adhesive-applied carpet as recommended by carpet manufacturers.

E. Verify dimensions of all areas to receive carpet. Contractor shall be responsible for the total carpet yardage necessary to recarpet the areas as shown on drawings. Do not rely on Architect's estimate.

3.04 FIELD QUALITY CONTROL

A. If in the Project Manager's opinion, there is any question as to the quality of the carpet and/or other materials delivered to the job site, the client reserves the option of selecting one square yard of carpet of any or all rolls for the testing. Similarly, representative samples of other materials may be requested for appropriate testing. The cost of such samples is to be borne by the contractor.

3.05 INSTALLATION

A. Carpeting shall be installed in locations shown on the drawings and specified herein in strict compliance with the reviewed and accepted submittals and the carpet manufacturer's specifications,installations instructions and recommendations.

B. Apply bead of seam adhesive along seams and trimmed edges where the face yarn enters the backing to prevent edge raveling. Seams shall lie flat with no visible puckering, unraveling, pulling or distortion.

C. Use trowelable leveling and patching compounds according to manufacturer's written instructions to fill cracks, holes and depression in substrates.

D. Install carpet by the direct glue-down method, strictly in accordance with the Carpet manufacturer's recommended installation practices.

1. Apply adhesive uniformly with a notched trowel.

2. Cover only that amount of area that can be covered by carpet within the recommended working time of adhesive.
3. Do not soil adjacent areas with adhesives.
4. Promptly remove spillage.
5. Provide and install stainless steel binder bar under doors, at transition between new and old carpet, and at other floor finishes as approved by the Architect.

E. Install carpet, wall to wall, using continuous lengths and broad widths as possible to minimize the placement of seams in traffic lanes. Cut edges shall be straight and true and appropriately treated to form invisible and
non-raveling joints where exposed.

F. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures and built-in furniture including cabinets, pipes, outlets, edgings, threshold and nosiness. bind and seal cut edges as recommended by carpet manufacturer.

G. Install base carpet where shown or required to match existing.

H. Roll carpet with a roller weighing 35-100 IBS. After application to remove air bubble and ensure proper adhesion to adjoining lengths of carpet and carpet bed, roll in both directions. Do not over roll.

I. Install edge strip at every location where edge of carpet is exposed to traffic, unless otherwise indicated. Install in single lengths wherever possible, secures in accordance with manufactur's directions.

J. Where carpet extends under expansion joint covers and thresholds, remove cover and threshold, replace carpet and reinstall joint covers and thresholds.

3.06 PROTECTION

A. Provide a heavy non-staining plastic/ brown paper on walkway as required over new carpeting in direction of traffic, as directed by the Architect maintaining intact until carpeted installation has been approved by the Architect.

B. Provide two rows of barrier tape and plastic stanchions at a minimum distance of ten (10) feet or as approved by the Architect.

3.07 CLEANING AND ADJUSTING

A. Remove spots and smears of cement from carpet immediately with the manufacture's recommended cleaning solution.

B. Remove rubbish, wrapping paper, salvage and scraps.

C. Remoave loose threads with scissors.

D. Repair or replace any damaged base and door trim.

E. Remove excess adhesive, seam elaer, and other surface blemishes using clear recommended by the carpet manufacturer.

F. Upon completion, vacuum installed carpet are floor with a commercial beater-bar- type vacuum cleaner each morning before leaving site.

G. After each area of carpet has been installed, protect from spoiling and damage.

H. Upon completion of the work each morning remove debris and waste material and legally dispose of the Airport.

3.08 REMEDIAL WORK

Any remedial work necessary as a result of faulty workmanship or materials will be replaced by the Contractor at no cost to the city. Work will be done at a time agreeable to the City sa as not to cause any interruption or inconvenience to EndUse Facility

3.09 MAINTANANCE STOCK

A. Furnish the client with 5% maintanance stock for the future replacement use consisting of the following:

1.Only unused carpet pieces over 120 sq feet will be considered maintenance stock.

B. Maintenance stock carpet shall be labeled to identify color, type, sizes, and locations where installed. It shall be packaged in appropriate wrapping and in a manner that will not damage or shorten the useful life of the carpet. Careful packaging is important since the replacement carpet will be stored in the original purchase.

C. Upon completion of installation, deliver maintenance stock carpet. Notify Contract Manager on the week prior to the carpet delivery.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, varnishes, and other coatings.

1.02 REFERENCES

A. ASTM D 16 - Standard Terminology for Paint, Coatings, Materials, and Applications; 1998b.

B. ASTM D 4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 1992 (Reapproved 1997).

C. NACE (IMP) - Industrial Maintenance Painting; NACE International; Edition date unknown.

D. SSPC (PM1) - Steel Structures Painting Manual, Vol. 1, Good Painting Practice; Society for Protective Coatings; 1993, Third Edition.

E. SSPC (PM2) - Steel Structures Painting Manual, Vol. 2, Systems and Specifications; Society for Protective Coatings; 1995, Seventh Edition.

1.03 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on all finishing products.

C. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on aluminum sheet, 6x6 inch in size.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.05 QUALITY ASSURANCE

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

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish Finishes: 65 degrees F (18 degrees C) for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Paints:
   1. Sherwin-Williams Co.
   2. ICI Paints North America.
   3. Benjamin Moore & Co.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
   1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
   2. For good flow and brushing properties.
   3. Capable of drying or curing free of streaks or sags.

2.03 PAINT SYSTEMS - See Finish Schedule

A. Paint WE-OP-3L - Wood, Opaque, Latex, 3 Coat: Wood stain shall be applied in shop. See LEED Requirements.
   1. One coat of latex primer sealer.
   2. Gloss: Two coats of latex enamel.
   3. Semi-gloss: Two coats of latex enamel.

B. Paint GE-OP-3L - Gypsum Board and Plaster, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer.
   2. Flat: Two coats of latex.

C. Paint MgE-OP-3L - Galvanized Metals, Latex, 3 Coat:
   1. One coat galvanize primer.
   2. Gloss: Two coats of latex enamel.
   3. Semi-gloss: Two coats of latex enamel.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Plaster and Gypsum Wallboard: 12 percent.
   2. Exterior Wood: 15 percent, measured in accordance with ASTM D 4442.

3.02 PREPARATION

A. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.

B. Plaster Surfaces to be Painted: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

C. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

D. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

E. Exterior Wood to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Sand wood surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

3.04 CLEANING

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

3.05 SCHEDULE - PAINT SYSTEMS

A. Plaster: Finish all new surfaces exposed to view.
   1. Interior Walls.

B. Wood: Finish all new surfaces exposed to view.
   1. Exterior trim and frames: WE-OP-3L.

C. Galvanized Steel: Finish all new surfaces exposed to view, except roofing material with galvalume finish.

D. Shop-Primed Metal Items: Finish all new surfaces exposed to view.

END OF SECTION

SECTION 10140 – POST AND ACRYLIC PANEL SIGNS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:

1. Post and Acrylic.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each sign type.

B. Shop Drawings: Include individual sign types, graphics, typestyles, colors, sign dimensions and profiles. Show mounting methods, locations, accessories and installation guidelines.

C. Samples: Provide a single unit sample of each sign type to verify colors, dimensions, profiles, finishes, method of installation and quality.

D. Sustainable Design Data: Provide data related to materials, processes and disposition of unused material substantiating sustainable sign manufacturing.

1. Recycled Content: For all manufactured sign product materials, indicate 40% of post-industrial recycled material content.

2. Locally Manufactured: For all manufactured sign product materials, indicate if manufacturing location of product is within 500 miles of the project site.

3. Low Emitting Materials: For all manufactured sign product material finishes, indicate the Volatile Organic Compound (VOC) limits in grams / liter or pounds / gallon.

a. All painted products shall contain a rating of no more than a 3.5 Volatile Organic Compound (VOC) content or 420 grams / liter.

4. Waste: For all manufactured sign product materials, indicate (%) biodegradability and method of disposal of all unused sign product materials.

5. Air Quality: For all manufactured sign products material finishes, provide copy of Volatile Organic Compound (VOC) reporting forms and Air Quality Permit certificate.

1.4 QUALITY ASSURANCE

A. Manufacturers: Sign Manufacturer shall not have less than ten (10) years experience manufacturing architectural and Americans with Disabilities Act (ADA) signs of the type specified herein.

1. Manufacturing lead-time for product delivered to site must not exceed four (4) weeks from receipt or order.

B. Installers: Sign installers shall be specialized and experienced in work similar to that required for this project and provide required mounting accessories, fittings, fasteners and installation guidelines unless otherwise specified.

C. Single Source Responsibility: Sign types specified in this section shall be obtained from a single source manufacturer and ready to install.

D. Regulatory Requirements: Signs shall comply with the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and with state building code provisions as adopted by any regulatory authority having jurisdiction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Basis of Design: Kroy Sign Systems LLC, 7575 E. Redfield Rd., Ste 113, Scottsdale, Arizona, 85260; Telephone (800) 950-5769; Fax (800) 916-3212;
Web: www.kroysignsystems.com; Email: signs@kroy.com

B. Basis of Design Product: Kroy Sign Systems Acrylic/Aluminum Advantage Signs or approved equal. Other manufacturers must submit sign sample prior to the bid date to be considered an approved equal.

2.2 MATERIALS

A. General: Provide acrylic panel signs and aluminum sign posts that comply with requirements indicated for materials, thickness, colors, designs, shapes, sizes and details of construction.

1. Produce panel signs to comply with the applicable provisions of the ADA Accessibility Guidelines and ICC / ANSI A117.1 / 98 standards including, but not limited to, 0.031" raised pictograms, text and Grade II Braille characters.

2. Panel signs shall be constructed to remain flat under installed conditions and within tolerance of plus or minus 0.015" when measured diagonally.

3. Provide aluminum sign assembly post and cap for sign panel accent and installation to flat wall surfaces.

B. Acrylic Panel Signs: Manufacturer's standard product and as follows:

1. Acrylic panel signs shall be fabricated from the manufacturer's list of applicable acrylic sign materials.

a. Gloss or non-glare clear acrylic. Select from base thicknesses of (0.125") or (0.25") inch. Material will be single piece construction and moisture resistant for interior sign applications. Specify (clear) or (surface) or (subsurface) painted material finish.

2. Panel signs shall include four 0.625" diameter satin aluminum sign posts for installation with corresponding 0.50" thick barrel for spacing and 0.187" thick post cap for sign panel faceplate accent.

3. Panel signs shall be precision laser, CNC router or saw cut to achieve dimensional shapes and sizes as specified or selected from the manufacturer's list of standard sizes.

4. Panel signs shall be clear painted using an acrylic polyurethane of consistant and uniform color.

5. Panel colors shall be selected from the manufacturer's list of standard colors.

6. Panel sign sizes shall be selected from the manufacturer's list of standard panel sizes unless otherwise specified.

7. Acrylic panel faceplate and backplate materials shall be finished with smooth edges and polished to conform to manufacturer's standard requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine wall surfaces, substrate areas and conditions with the Installer present, for compliance with the requirements for installation guidelines, tolerances and other conditions affecting the performance of work.

B. Verify that items including anchor inserts and electrical power provided under other sections of work are sized and located to accommodate the non-illuminated directory signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with the authorities having jurisdiction and are free from dirt and other deleterious matter.

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

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated by ADA standards, with sign surfaces free from distortion and other defects in appearance.

2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of the door.

B. Sign Information:

1. Men 102 – Door 018
2. Janitors Closet 102B – Door 018A
3. Women 103 – Door 117
4. Employees Only 105 – Door 001
5. Supply Room 105A – Door 004
6. Electrical Room 105B – Door 003
7. Branch Managers Office 105C – Door 002
8. Employees Only – Door 005
9. Employees Only – Exterior Door 006
10. Staff Rest Area 107 – Door 007
11. Staff Restroom 107A – Door 008
12. Mechanical/Electrical Room 108 – Door 011

13. Hallway 109 – Door 010
14. Employees Only – Exterior Door 012
15. EMS 109A – Door 10A
16. EMS Restroom 109B – Door 10B
17. Study Room 110 – Door 013
18. IT Room 111 – Door 014
19. Teen Room 112 – Door 115
20. Community Room 118 – Door 019 Restroom Side
21. Restrooms – Door 019 Community Room Side
22. Community Room 118 – Door 020 Library Side
23. Library – Door 020 Community Room Side
24. Large Meeting Room 119 – Door 031
25. Large Meeting Room Storage 119A – Door 030
26. Large Meeting Room A/V 119B – Door 029
27. Kitchen 121 – Door 24B Large Meeting Room Side
28. Exit Only – Exterior Door 027
29. Small Meeting Room 120 – Door 021
30. Small Meeting Room Storage 120A – Door 023
31. Small Meeting Room A/V 120B – Door 022
32. Kitchen 121 – Door 024A
33. Exit Only – Exterior Door 025
34. Small Meeting Room 120 – Door 024A Kitchen Side
35. Large Meeting room 119 – Door 24B Kitchen Side
36. Kitchen 121 – Exterior Door 026

C. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated.

1. Mechanical Fasteners: Use manufacturer's standard fittings, hardware and spacers placed through predrilled holes in the sign panels. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended by the sign manufacturer. Satin Finish.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by owner.

END OF SECTION

SECTION 10255 – STUCCO WALL SYSTEM

PART I – GENERAL

1.01 SUMMARY

A. **This document is to be used in preparing specifications for projects utilizing the Dryvit Outsulation System as the Basis of Design.** For complete product description and usage refer to:
1. Dryvit Outsulation System Data Sheet, DS447.
2. Dryvit Outsulation System Application Instructions, DS204.
3. Dryvit Outsulation System Installation Details, DS107.

B. Related Sections
1. Unit Masonry – Section 04200
2. Concrete – Sections 03300 and 03400
3. Light Gauge Cold Formed Steel Framing – Section 05400
4. Wood Framing – Section 06100
5. Sealant – Section 07900
6. Flashing – Section 07600

1.02. REFERENCES

A. Section Includes
1. ASTM B 117 (Federal Test Standard 141A Method 6061) Standard Practice for Operating Salt Spray (Fog) Apparatus
2. ASTM C 150 Standard Specification for Portland Cement
3. ASTM C 297 Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
4. ASTM C 1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
5. ASTM C 1396 (formerly C 79) Standard Specification for Gypsum Board
6. ASTM D 968 (Federal Test Standard 141A Method 6191) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
7. ASTM D 2247 (Federal Test Standard 141A Method 6201) Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
8. ASTM D 2898 Standard Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
9. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
10. ASTM D 4060 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
11. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
12. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
13. ASTM E 119 Standard Method for Fire Tests of Building Construction and Materials
14. ASTM E 330 Test Method for Structural Performance of Exterior Windows, Doors and Curtain Walls by Uniform Static Air Pressure Difference
15. ASTM E 331 Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.
16. ASTM E 2098 Test Method for Determining the Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for use in Class PB Exterior Insulation and Finish Systems (EIFS), after Exposure to Sodium Hydroxide Solution
17. ASTM E 2134 Test Method for Evaluating the Tensile-Adhesion Performance of Exterior Insulation and Finish Systems (EIFS)
18. ASTM E 2430 Standard Specification for Expanded Polystyrene (EPS) Thermal Insulation Boards for use in Exterior Insulation and Finish System (EIFS)
19. ASTM E 2485 (formerly EIMA Std. 101.01) Standard Test Method for Freeze-Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water-Resistive Barrier Coatings
20. ASTM E 2486 (formerly EIMA Std. 101.86) Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS)
21. ASTM G 155 (Federal Test Standard 141A Method 6151) Standard Practice for Operating-Xenon Arc Light Apparatus, for Exposure of Nonmetallic Materials
22. DS107, Dryvit Outsulation System Installation Details
23. DS131, Dryvit Expanded Polystyrene Insulation Board Specification

24. DS135, Specification for Outsulation System with Mechanical Fasteners
25. DS151, Custom Brick™ Polymer System Specifications for Use on Vertical Walls
26. DS152, Dryvit Cleaning and Recoating
27. DS153, Dryvit Expansion Joints and Sealants
28. DS159, Dryvit Water Vapor Transmission
29. DS204, Dryvit Outsulation System Application Instructions
30. DS456, Rapidry DM™ 35-50 or DS457, Rapidry DM™ 50-75 Data Sheets
31. DS494, Dryvit AquaFlash® System
32. DS705, Reflectit™
33. DS706, Mojave E™ Finish
34. Mil Std E5272 Environmental Testing
35. Mil Std 810B Environmental Test Methods
36. UBC Std 26-4 (Formerly UBC 17-6) Multi-Story Fire Evaluation of Exterior Non Load-Bearing Foam Plastic Insulated Wall Systems
37. NFPA 268 Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.
38. NFPA 285 Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus
39. ULC S101 Standard Methods of Fire Endurance Tests of Building Construction Materials
40. ANSI FM 4880 Evaluating Insulated Wall or Wall and Roof/Ceiling Assemblies; Plastic Interior Finish Materials; Plastic Exterior Building Panels; Wall/Ceiling Coating Systems; Interior or Exterior Finish Systems

1.03 DEFINITIONS

A. Base Coat: Material used to encapsulate one or more layers of reinforcing mesh fully embedded that is applied to the outside surface of the EPS.
B. Building Expansion Joint: A joint through the entire building structure designed to accommodate structural movement.
C. Contractor: The contractor that installs the Outsulation System to the substrate.
D. Dryvit: Dryvit Systems, Inc., the manufacturer of the Outsulation System, a Rhode Island corporation.
E. Expansion Joint: A structural discontinuity in the Outsulation System.
F. Finish: An acrylic-based coating, available in a variety of textures and colors that is applied over the base coat.
G. Insulation Board: Expanded polystyrene (EPS) insulation board, which is affixed to the substrate.
H. Panel Erector: The contractor who installs the panelized Outsulation System.
I. Panel Fabricator: The contractor who fabricates the panelized Outsulation System.
J. Reinforcing Mesh: Glass fiber mesh(es) used to reinforce the base coat and to provide impact resistance.
K. Sheathing: A substrate in sheet form.
L. Substrate: The material to which the Outsulation System is affixed.
M. Substrate System: The total wall assembly including the attached substrate to which the Outsulation System is affixed.

1.04 SYSTEM DESCRIPTION

A. General: The Dryvit Outsulation System is an Exterior Insulation and Finish System, Class PB, consisting of an adhesive, expanded polystyrene insulation board, base coat, reinforcing mesh(es) and finish. Mechanically attached systems shall conform to Dryvit specification DS135.

B. Methods of Installation
1. Field Applied: The Outsulation System is applied to the substrate system in place.

C. Design Requirements
1. Acceptable substrates for the Outsulation System shall be:
   a. Exterior grade gypsum sheathing meeting ASTM C 1396 (formerly C 79) requirements for water-resistant core or Type X core at the time of application of the Outsulation System.
   b. Exterior sheathing having a water-resistant core with fiberglass mat facers meeting ASTM C 1177.
   c. Exterior fiber reinforced cement or calcium silicate boards.

d. APA Exterior or Exposure 1 Rated Plywood, Grade C-D or better, nominal 12.7 mm (1/2 in), minimum 4-ply.
e. Unglazed brick, cement plaster, concrete, or masonry.
f. APA Exposure 1 rated Oriented Strand Board (OSB), nominal 12.7 mm (1/2 in).
g. Galvanized expanded metal lath 1.4 or 1.8 kg/m² (2.5 or 3.4 lbs/yd²) installed over a solid substrate.
h. Exterior grade fire retardant treated plywood. **Note: Fire retardant treated plywood requires the use of Backstop NT. Refer to DS181 Backstop NT Application Instructions.**

2. Deflection of substrate systems shall not exceed 1/240 times the span.
3. The substrate shall be flat within 6.4 mm (1/4 in) in a 1.2 m (4 ft) radius.
4. The slope of inclined surfaces shall not be less than 6 in 12 (27°), and the length shall not exceed 305 mm (12 in).
5. All areas requiring an impact resistance classification higher than "standard", as defined by ASTM E 2486 (formerly EIMA Std. 101.86), shall be as detailed in the drawings and described in the contract documents. Refer to Section 1.04.D.1.c of this specification.
6. Expansion Joints
   a. Design and location of expansion joints in the Outsulation System is the responsibility of the project designer and shall be noted on the project drawings. As a minimum, expansion joints shall be placed at the following locations:
      1) Where expansion joints occur in the substrate system.
      2) Where building expansion joints occur.
      3) At floor lines in wood frame construction.
      4) At floor lines of non-wood framed buildings where significant movement is expected.
      5) Where the Outsulation System abuts dissimilar materials.
      6) Where the substrate type changes
      7) Where prefabricated panels abut one another
      8) In continuous elevations at intervals not exceeding 23 m (75 ft).
      9) Where significant structural movement occurs such as changes in roofline, building shape or structural system.
7. Terminations
   a. Prior to applying the Dryvit Outsulation System, wall openings shall be treated with Dryvit AquaFlash System or Flashing Tape. Refer to Dryvit Outsulation System Installation Details, DS107.
   b. The Outsulation System shall be held back from adjoining materials around openings and penetrations such as windows, doors and mechanical equipment a minimum of 19 mm (3/4 in) for sealant application. See Dryvit's Outsulation System Installation Details, DS107.
   c. The system shall be terminated a minimum of 203 mm (8 in) above finished grade.
   d. Sealants
      1) Shall be manufactured and supplied by others.
      2) Shall be compatible with Outsulation System materials. Refer to current Dryvit Publication DS153 for listing of sealants tested by sealant manufacturer for compatibility.
      3) The sealant backer rod shall be of closed cell.
8. Vapor Retarders – The use and location of vapor retarders within a wall assembly is the responsibility of the project designer and shall comply with local building code requirements. The type and location shall be noted on the project drawings and specifications. Vapor retarders may be inappropriate in certain climates and can result in condensation within the wall assembly. Refer to Dryvit Publication DS159 for additional information.
9. Dark Colors – The use of dark colors must be considered in relation to wall surface temperature as a function of local climatic conditions. Use of dark colors in high temperature climates can affect the performance of the system.
10. Flashing: Shall be provided at all roof-wall intersections, windows, doors, chimneys, decks, balconies and other areas as necessary to prevent water from entering behind the Outsulation System.

D. Performance Requirements
1. The Outsulation System shall have been tested as follows:
   a. Durability

TEST	TEST METHOD	CRITERIA	RESULTS
Abrasion Resistance	ASTM D 968	No deleterious effects after 500 liters (528 quarts)	No deleterious effects after 1000 liters (1056 quarts)

Accelerated Weathering	ASTM G 155 Cycle 1	No deleterious effects after 2000 hours	No deleterious effects after 5000 hours
	ASTM G 154 Cycle 1 (QUV)		No deleterious effects after 5000 hours
Freeze-Thaw	ASTM E 2485 (formerly EIMA 101.01)	No deleterious effects after 60 cycles	Passed - No deleterious effects after 90 cycles
	ASTM C 67 modified	No deleterious effects after 60 cycles	Passed - No deleterious effects after 60 cycles
	ASTM E 2485/ICC-ES Proc.; ICC ES (AC219)***	No deleterious effects after 10 cycles	Passed - No deleterious effects after 10 cycles
Mildew Resistance	ASTM D 3273	No growth during 28 day exposure period	No growth during 60 day exposure period
Water Resistance	ASTM D 2247	No deleterious effects after 14 days exposure	No deleterious effects after 42 days exposure
Taber Abrasion	ASTM D 4060	N/A	Passed 1000 cycles
Salt Spray Resistance	ASTM B 117	No deleterious effects after 300 hours exposure	No deleterious effects after 1000 hours exposure
Water Penetration	ASTM E 331 ICC ES (AC 219)***	No water penetration beyond the inner-most plane of the wall after 2 hours at 299 Pa (6.24 psf)	Passed 2 hours at 299 Pa (6.24 psf)
Water Vapor Transmission	ASTM E 96 Procedure B	Vapor permeable	EPS 5 perm-inch Base Coat* 40 Perms Finish** 40 Perms
* Base Coat perm value based on Dryvit Genesis® ** Finish perm value based on Dryvit Quarzputz *** AC 219 - Acceptance Criteria for EIFS			

b. Structural

TEST	TEST METHOD	CRITERIA	RESULTS
Tensile Bond	ASTM C 297/E 2134	Minimum 104 kPa (15 psi) - substrate or insulation failure	Minimum 132 kPa (19.1 psi)
Transverse Wind Load	ASTM E 330	Withstand positive and negative wind loads as specified by the building code	Minimum 4.3 kPa (90 psf)* 16 inch o.c. framing, ½ in sheathing screw attached at 203 mm (8 inch) o.c.
* All Dryvit components remain intact - for higher wind loads contact Dryvit Systems, Inc.			

c. Impact Resistance: In accordance with ASTM E 2486 (formerly EIMA Standard 101.86).

Reinforcing Mesh[1]/Weight g/m² (oz/yd²)	Minimum Tensile Strengths	EIMA Impact Classification	EIMA Impact Range Joules	(in-lbs)	Impact Test Results Joules	(in-lbs)
Standard - 146 (4.3)	27 g/cm (150 lbs/in)	Standard	3-6	(25-49)	4	(36)
Standard Plus - 203 (6)	36 g/cm (200 lbs/in)	Medium	6-10	(50-89)	6	(56)
Intermediate™ - 407 (12)	54 g/cm (300 lbs/in)	High	10-17	(90-150)	12	(108)
Panzer® 15 * - 509 (15)	71 g/cm (400 lbs/in)	Ultra High	>17	(>150)	18	(162)
Panzer 20 * - 695 (20.5)	98 g/cm (550 lbs/in)	Ultra High	>17	(>150)	40	(352)
Detail® Short Rolls - 146 (4.3)	27 g/cm (150 lbs/in)	n/a	n/a	n/a	n/a	n/a
Corner Mesh™ - 244 (7.2)	49 g/cm (274 lbs/in)	n/a	n/a	n/a	n/a	n/a

*Shall be used in conjunction with Standard Mesh (recommended for areas exposed to high traffic) 1. It shall be colored blue and bear the Dryvit logo for product identification.

d. Fire performance

TEST	TEST METHOD	CRITERIA	RESULTS
Fire Resistance	ASTM E 119	No effect on the fire resistance of a rated wall assembly	Passed 1 hour Passed 2 hour
Ignitability	NFPA 268	No ignition at 12.5 kw/m² at 20 minutes	Passed
Full Scale Multi-Story Fire Test	UBC Std. 26-4 (formerly 17-6)	1. Resist vertical spread of flame within the core of the panel from one story to the next 2. Resist flame propagation over the exterior surface 3. Resist spread of vertical flame over the interior surface from one story to the next 4. Resist significant lateral spread of flame from the compartment of fire origin to adjacent spaces	Passed
Intermediate Multi-Story Fire Test	NFPA 285 (UBC 26-9)	1. Resist flame propagation over the exterior surface 2. Resist vertical spread of flame within combustible core/component of panel from one story to the next 3. Resist vertical spread of flame over the interior surface from one story to the next 4. Resist lateral spread of flame from the compartment of fire origin to adjacent spaces	Passed
Full Scale Multi-Story* (corner test)	ANSI FM 4880	Resist flame propagation over the exterior surface.	Passed; No height restrictions*
* Dryvit FM products must be specified			

2. The Outsulation components shall be tested for:
   a. Fire

TEST	TEST METHOD	CRITERIA	RESULTS
Surface Burning Characteristics	ASTM E 84	All components shall have a: Flame Spread $\leq$ 25 Smoke Developed $\leq$ 450	Passed

b. Durability

TEST	TEST METHOD	CRITERIA	RESULTS
Reinforcing Mesh **Alkali Resistance of Reinforcing Mesh**	ASTM E 2098 (formerly EIMA 105.01)	> 21dN/cm (120 pli) retained tensile strength after exposure	Passed
EPS (Physical Properties) **Density** **Thermal Resistance** **Water Absorption**	 ASTM C 303, D 1622 ASTM C 177, C 518 ASTM C 272	 15.2-20.0 kg/m³ (0.95-1.25 lb/ft³) 4.0 @ 4.4 °C (40 °F) 3.6 @ 23.9 °C (75 °F)	 Pass Pass Pass Pass

Oxygen Index	ASTM D 2863	2.5 % max. by volume	Pass
Compressive Strength	ASTM D 1621 Proc. A	24% min. by volume	Pass
Flexural Strength	ASTM C 203	69 kPa (10 psi) min.	Pass
Flame Spread	ASTM E 84	172 kPa (25 psi) min.	Pass
Smoke Developed		25 max.	Pass
		450 max.	

1.05 SUBMITTALS

A. Product Data – The contractor shall submit to the owner/architect the manufacturer's product data sheets describing products, which will be used on this project.
B. Shop Drawing for Panelized Construction: The panel fabricator shall prepare and submit to the owner/architect complete drawings, showing: wall layout, connections, details, expansion joints and installation sequence.
C. Samples: The contractor shall submit to the owner/architect two (2) samples of the Outsulation System for each finish, texture and color to be used on the project. The same tools and techniques proposed for the actual installation shall be used. Samples shall be of sufficient size to accurately represent each color and texture being utilized on the project.
D. Test Reports – When requested, the contractor shall submit to the owner/architect copies of selected test reports verifying the performance of the Outsulation System.

1.06 QUALITY ASSURANCE

A. Qualifications
1. System Manufacturer: Shall be Dryvit Systems, Inc. All materials shall be manufactured or sold by Dryvit and shall be purchased from Dryvit or its authorized distributors.
   a. Materials shall be manufactured at a facility covered by a current ISO 9001:2008 certification and ISO 14001:2004. Certification of the facility shall be done by a registrar accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB).
2. Contractor: Shall be knowledgeable in the proper installation of the Dryvit Outsulation System and shall be experienced and competent in the installation of Exterior Insulation and Finish Systems. Additionally, the contractor shall possess a current Outsulation System Trained Contractor Certificate* issued by Dryvit Systems, Inc.
3. Insulation Board Manufacturer: Shall be listed by Dryvit Systems, Inc., shall be capable of producing the Expanded Polystyrene (EPS) in accordance with current Dryvit Specification for Insulation Board, DS131, and shall subscribe to the Dryvit Third Party Certification and Quality Assurance Program.

B. Regulatory Requirements
1. The EPS shall be separated from the interior of the building by a minimum 15-minute thermal barrier.
2. The use and maximum thickness of EPS shall be in accordance with the applicable building codes.

C. Certification
1. The Outsulation System shall be recognized for the intended use by the applicable building code(s).

D. Mock-Up
1. The contractor shall, before the project commences, provide the owner/architect with a mock-up for approval.
2. The mock-up shall be of suitable size as required to accurately represent the products being installed, as well as each color and texture to be utilized on the project.
3. The mock-up shall be prepared with the same products, tools, equipment and techniques required for the actual application. The finish used shall be from the same batch that is being used on the project.
4. The approved mock-up shall be available and maintained at the job site.

1.07 DELIVERY, STORAGE AND HANDLING

A. All Dryvit materials shall be delivered to the job site in the original, unopened packages with labels intact.
B. Upon arrival, materials shall be inspected for physical damage, freezing, or overheating. Questionable materials shall not be used.
1. Materials shall be stored at the jobsite in a cool, dry location, out of direct sunlight, protected from weather and other sources of damage. Minimum storage temperature shall be as follows:
   a. Demandit®, and Revyvit®: 7 °C (45 °F)
   b. Ameristone™, TerraNeo®, Lymestone™, and Reflectit: 10 °C (50 °F)
   c. DPR, PMR™ and E™ Finishes, Color Prime™, Primus®, Genesis and NCB™: 4 °C (40 °F)
   d. For other products, refer to specific product data sheets.

2. Maximum storage temperature shall not exceed 38° C (100 °F).
   Note: Minimize exposure of materials to temperatures over 32 °C (90 °F). Finishes exposed to temperatures over 43 °C (110 °F) for even short periods may exhibit skinning, increased viscosity and should be inspected prior to use.

C. Protect all products from inclement weather and direct sunlight.

1.08 PROJECT CONDITIONS

A. Environmental Requirements
   1. Application of wet materials shall not take place during inclement weather unless appropriate protection is provided. Protect materials from inclement weather until they are completely dry.
   2. At the time of application, the minimum air and wall surface temperatures shall be as follows:
      a. Demandit®, and Revyvit®: 7 °C (45 °F)
      b. Ameristone™, TerraNeo®, Lymestone™, and Reflectit: 10 °C (50 °F)
      c. DPR, PMR and E Finishes, Color Prime, Primus, Genesis and NCB: 4 °C (40 °F)
      d. For other products, refer to specific product data sheets.
   3. These temperatures shall be maintained with adequate air ventilation and circulation for a minimum of 24 hours (48 hours for Ameristone, TerraNeo and Lymestone) thereafter, or until the products are completely dry. Refer to published product data sheets for more specific information.

B. Existing Conditions – The contractor shall have access to electric power, clean water, and a clean work area at the location where the Dryvit materials are to be applied.

1.09 SEQUENCING AND SCHEDULING

A. Installation of the Outsulation System shall be coordinated with other construction trades.
B. Sufficient manpower and equipment shall be employed to ensure a continuous operation, free of cold joints, scaffold lines, texture variations, etc.

1.10 LIMITED MATERIALS WARRANTY

A. Dryvit Systems, Inc. shall provide a written limited materials warranty against defective material upon written request. Dryvit shall make no other warranties, expressed or implied. Dryvit does not warrant workmanship. Full details are available from Dryvit Systems, Inc.
B. The applicator shall warrant workmanship separately. Dryvit shall not be responsible for workmanship associated with installation of the Outsulation System.

1.11 DESIGN RESPONSIBILITY

A. It is the responsibility of both the specifier and the purchaser to determine if a product is suitable for its intended use. The designer selected by the purchaser shall be responsible for all decisions pertaining to design, detail, structural capability, attachment details, shop drawings and the like. Dryvit has prepared guidelines in the form of specifications, installation details and product sheets to facilitate the design process only. Dryvit is not liable for any errors or omissions in design, detail, structural capability, attachment details, shop drawings, or the like, whether based upon the information prepared by Dryvit or otherwise, or for any changes which purchasers, specifiers, designers, or their appointed representatives may make to Dryvit's published comments.

1.12 MAINTENANCE

A. Maintenance and repair shall follow the procedures noted in Dryvit Outsulation Application Instructions, DS204.
B. All Dryvit products are designed to require minimal maintenance. However, as with all building products, depending on location, some cleaning may be required. See Dryvit publication DS152 on Cleaning & Recoating.
C. Sealants and Flashings should be inspected on a regular basis and repairs made as necessary.

PART II – PRODUCTS

2.01 MANUFACTURER

A. All components of the Outsulation System shall be supplied or obtained from Dryvit or its authorized distributors. Substitutions or additions of materials other than specified will void the warranty.

2.02 MATERIALS

A. Portland Cement: Shall be Type I or II, meeting ASTM C 150, white or gray in color, fresh and free of lumps.
B. Water: Shall be clean and free of foreign matter.
C. Mechanical Fasteners (required when installing in accordance with DS135): Shall be Wind-lock's Wind Devil™ plates, or equivalent, used in conjunction with corrosion resistant fasteners appropriate for the substrate system.

2.03 COMPONENTS

A. Flashing Materials: Used to protect substrate edges at terminations.
   1. Liquid Applied: An extremely flexible water-based polymer material, ready for use.
      a. Shall be AquaFlash and AquaFlash Mesh
   2. Sheet Type:
      a. Shall be Flashing Tape and Surface Conditioner
         1) Dryvit Flashing Tape™: A high density polyethylene film backed with a rubberized asphalt adhesive available in rolls 102 mm (4 in), 152 mm (6 in) and 229 mm (9 in) wide by 23 m (75 ft) long.
         2) Dryvit Flashing Tape Surface Conditioner™: A water-based surface conditioner and adhesion promoter for the Dryvit Flashing Tape.
B. Adhesives: Used to adhere the EPS to the substrate, shall be compatible with the substrate and the EPS.
   1. Cementitious: A liquid polymer-based material, which is field mixed with Portland cement for use over non wood-based substrates.
      a. Shall be Primus®, Genesis® or Genesis® FM
   2. Ready mixed: A dry blend cementitious, copolymer-based product, field mixed with water for use over non wood-based substrates.
      a. Shall be Primus® DM, Genesis® DM, Genesis® DMS, Rapidry DM 35-50 or Rapidry DM 50-75.
   3. Noncementitious: A factory-mixed, fully formulated water-based adhesive for use over wood-based substrates.
      a. Shall be ADEPS®.
C. Insulation Board: Expanded polystyrene meeting Dryvit Specification for Insulation Board, DS131.
   1. Thickness of insulation board shall be minimum (1 1/2 in) and shall be maintained at all locations.
   2. The insulation board shall be manufactured by a board supplier listed by Dryvit Systems, Inc.
D. Base Coat: Shall be compatible with the EPS insulation board and reinforcing mesh(es).
   1. Cementitious: A liquid polymer-based material, which is field mixed with Portland cement.
      a. Shall be Primus, Genesis or Genesis FM.
   2. Noncementitious: A factory-mixed, fully formulated, water-based product.
      a. Shall be NCB™.
   3. Ready mixed: A dry blend cementitious, copolymer-based product, field mixed with water.
      a. Shall be Primus DM, Genesis DM, Genesis DMS, Rapidry DM 35-50 or Rapidry DM 50-75.
E. Reinforcing Mesh: A balanced open weave, glass fiber fabric treated for compatibility with other system materials. Reinforcing Mesh shall be installed 6'-0" off finished floor **Note: Reinforcing meshes are classified by impact resistance and specified by weight and tensile strength as Section 1.04.D.1.c.**
   1. Shall be Standard, Standard Plus, Intermediate, Panzer 15, Panzer 20, Detail and Corner Mesh.
F. Finish: Shall be the type, color and texture as selected by the architect/owner and shall be one or more of the following: Finish to be determined by the Architect.
   1. Standard DPR (Dirt Pickup Resistance): Water-based, acrylic coating with integral color and texture and formulated with DPR chemistry:
      a. Quarzputz® DPR: Open-texture.
      b. Sandblast® DPR: Medium texture.
      c. Freestyle® DPR: Fine texture.
      d. Sandpebble® DPR: Pebble texture.
      e. Sandpebble® Fine DPR: Fine pebble texture.
   2. E: Water-based, lightweight acrylic coating with integral color and texture and formulated with DPR chemistry:
      a. Quarzputz® E
      b. Sandpebble® E
      c. Sandpebble® Fine E
   3. Finish with recycled content:
      a. Mojave E: Water based, 100% acrylic finish containing 20% post consumer recycled content and formulated with DPR chemistry.
   4. FM: Water-based, acrylic coating with integral color and texture, formulated with PMR chemistry:
      a. Sandpebble® FM

b. Sandpebble® Fine FM
5. Specialty: Factory mixed, water-based acrylic:
a. Ameristone: Multi-colored quartz aggregate with a flamed granite appearance.
b. Stone Mist®: Ceramically colored quartz aggregate.
c. Custom Brick: Acrylic polymer-based finish used in conjunction with a proprietary template system to create the look of stone, brick, slate or tile.
d. TerraNeo: 100% acrylic-based finish with large mica chips and multi-colored quartz aggregates.
e. Lymestone: A premixed, 100% acrylic-based finish designed to replicate the appearance of limestone blocks.
f. Reflectit: 100% acrylic coating providing a pearlescent appearance.
6. Elastomeric DPR (Dirt Pickup Resistance): Water-based elastomeric acrylic coating with integral color and texture and formulated with DPR chemistry:
a. Weatherlastic® Quarzputz
b. Weatherlastic® Sandpebble
c. Weatherlastic® Sandpebble Fine
d. Weatherlastic® Adobe
7. Medallion Series PMR™ (Proven Mildew Resistance): Water-based acrylic coating with integral color and texture and formulated with PMR chemistry:
a. Quarzputz® PMR
b. Sandblast® PMR
c. Freestyle® PMR
d. Sandpebble® PMR
e. Sandpebble® Fine PMR
8. Coatings, Primers and Sealers:
a. Demandit
b. Weatherlastic® Smooth
c. Tuscan Glaze™
d. Revyvit
e. Color Prime
f. Prymit®
g. SealClear™

PART III - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the Outsulation System, the contractor shall verify that the substrate:
1. Is of a type listed in Section 1.04.C.1.
2. Is flat within 6.4 mm (1/4 in) in a 1.2 m (4 ft) radius.
3. Is sound, dry, connections are tight, has no surface voids, projections or other conditions that may interfere with the Outsulation System installation or performance.

B. Prior to the installation of the Outsulation System, the architect or general contractor shall insure that all needed flashings and other waterproofing details have been completed, if such completion is required prior to the Outsulation application. Additionally, the Contractor shall ensure that:
1. Metal roof flashing has been installed in accordance with Asphalt Roofing Manufacturers Association (ARMA) Standards.
2. Openings are flashed in accordance with the Outsulation System Installation Details, DS107, or as otherwise necessary to prevent water penetration.
3. Chimneys, Balconies, and Decks have been properly flashed.
4. Windows, Doors, etc. are installed and flashed per manufacturer's requirements and the Outsulation System Installation Details, DS107.

C. Prior to the installation of the Outsulation System, the contractor shall notify the general contractor, and/or architect, and/or owner of all discrepancies.

3.02 PREPARATION

A. The Outsulation materials shall be protected by permanent or temporary means from inclement weather and other sources of damage prior to, during, and following application until completely dry.
B. Protect adjoining work and property during Outsulation installation.
C. The substrate shall be prepared as to be free of foreign materials, such as, oil, dust, dirt, form release agents,

efflorescence, paint, wax, water repellants, moisture, frost and any other condition that inhibit adhesion.

3.03 INSTALLATION

A. The system shall be installed in accordance with the current Dryvit Outsulation System Application Instructions, DS204.
B. The overall minimum base coat thickness shall be sufficient to fully embed the mesh. The recommended method is to apply the base coat in two (2) passes.
C. Sealant shall not be applied directly to textured finishes or base coat surfaces. Dryvit Outsulation System base coat surfaces in contact with sealant shall be coated with Demandit or Color Prime.
D. When installing the Outsulation System, the notched trowel method of adhesive application shall be used over gypsum sheathing substrates.
E. High impact meshes shall be installed as specified at ground level, high traffic areas and other areas exposed to or susceptible to impact damage.

3.04 FIELD QUALITY CONTROL

A. The contractor shall be responsible for the proper application of the Outsulation materials.
B. Dryvit assumes no responsibility for on-site inspections or application of its products.
C. If required, the contractor shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures, workmanship and as to the specific products used.
D. If required, the EPS supplier shall certify in writing that the EPS meets Dryvit's specifications.
E. If required, the sealant contractor shall certify in writing that the sealant application is in accordance with the sealant manufacturer's and Dryvit's recommendations.

3.05 CLEANING

A. All excess Outsulation System materials shall be removed from the job site by the contractor in accordance with contract provisions and as required by applicable law.
B. All surrounding areas, where the Outsulation System has been installed, shall be left free of debris and foreign substances resulting from the contractor's work.

3.06 PROTECTION

A. The Outsulation System shall be protected from inclement weather and other sources of damage until dry and permanent protection in the form of flashings, sealants, etc. are installed.

END OF SECTION

SECTION 10522 FIRE EXTINGUISHERS

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 following:

1. Fire extinguishers.
2. Fire extinguisher mounting brackets.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Samples for initial selection purposes in the form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers from one source from a single manufacturer.

B. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

C. FM-Listed Products: Fire extinguishers approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher with FM marking.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Ansul Fire Protection.
2. Badger-Powhatan.
3. Croker Div., Fire-End and Croker Corp.
4. Filtrine Manufacturing.
5. J.L. Industries.
6. Larsen's Manufacturing Co.
7. Modern Metal Products by Muckle.
8. Potter-Roemer, Inc.
9. Samson Metal Products, Inc.

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each location indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.

B. Multipurpose Dry Chemical Type: UL-rated 4-A:6-B:C, 10-lb nominal capacity, in enameled steel container for class A, Class B and Class C fires.

2.3 MOUNTING BRACKETS

A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.
   1. Provide brackets for extinguishers at Mechanical Rooms.

2.4 CABINETS

A. Provide fire extinguisher cabinets where indicated on the life safety plan, of suitable size for housing fire extinguishers of types and capacities indicated.

B. Materials: Fabrication: Manufacturer’s standard enamel steel box with trim, frame, door and hardware to suit cabinet type, trim style and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames

C. Cabinet Type: Semi-recessed.

D. Door Style: Manufacturer’s Full Panel: Provide acrylic panel.

E. Door Hardware: Provide manufacturer’s standard door operating hardware. Provide door pull and lock. Provide continuous type hinge.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.
   1. Fasten mounting brackets and cabinets to structure, square and plumb.
   2. NFPA 10, Standard 6.1.3.8.1: Extinguishers Under 40 Pounds
      A fire extinguisher weighing less than 40 pounds, should be hung so that the top is not more than five feet above the ground, but no lower than four inches above the floor, according to the National Fire Protection Association's Standard for portable fire extinguishers, NFPA-10.
   3. NFPA 10, Standard 6.1.3.8.2: Extinguishers Over 40 Pounds
      Larger extinguishers, those weighing more than 40 pounds or more. The NFPA Standard dictates that the top of these heavyweights can be no more than 3-1/2 feet from the floor.

3.3 IDENTIFICTION

A. Identify bracket-mounted extinguishers with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style and location as selected by Architect.

END OF SECTION

SECTION 11131-ELECTRIC PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Automatic, electrically operated, roll-up projection screens, controls, and accessories.

B. Related sections:

1. Section 16100 - Wiring Methods: Electrical supply for electric screens.

1.2 REFERENCES

A. Society of Motion Picture and Television Engineers (SMPTE):

1. SMPTE RP 94-2000 - Gain Determination of Front Projection Screens.

1.3 DEFINITIONS

A. Gain: Indication of screen's luminance or brightness measured perpendicular of screen center and measured relative to a block of magnesium carbonate which serves as the standard for 1.0 gain. Higher numbers indicate greater brightness. Gain shall be determined in accordance with SMPTE RP 94-2000.

B. Viewing angle: Angle from perpendicular center of screen at which the gain or brightness is decreased by 50 percent.

C. Keystone: Distortion of projected image when screen is not perpendicular with center line of projected image.

1.4 SUBMITTALS

A. Provide in accordance with Section 01330 - Submittal Procedures:

1. Product data for projection screens and accessories.

2. Shop drawings: Indicate dimensions, fabrication and installation details, and electric wiring diagrams.

3. Samples:

a. Finishes [Matt White].

b. Viewing surface: 106” high x 188” wide

4. Manufacturer's installation, operation, maintenance, and cleaning instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer qualifications: Firm with 30 years minimum successful experience manufacturing electric projection screens.

B. Motors for electric screens shall be certified by Underwriters Laboratory (UL), Inc. and shall bear UL label.

C. Screens recessed installed in return air ceiling plenums shall be certified by Underwriters Laboratory (UL), Inc. and shall bear UL label.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens after building is enclosed and construction in rooms where screens will be installed is substantially complete.

B. Deliver screens in manufacturer's undamaged, labelled packaging.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Da-Lite Screen Company, Inc.

1. Address: 3100 North Detroit Street, P.O. Box 137, Warsaw, Indiana 46581-0137.

2. Telephone: 800-622-3737 or 574-267-8101.

3. Fax: 574-267-7804.

4. Website: www.da-lite.com.

B. Requests to use equivalent products of other manufacturers shall be submitted in accordance with Section 01630 - Product Substitution Procedures.

2.2 ROLLERS

A. Provide rigid metal rollers for operation of electric screens. Fabricate from either steel or aluminum. Material and roller diameter determined by manufacturer as required by type and size of electric screen.

2.3 OPERATING MOTORS

A. Equip electric screens with UL labeled motors to operate screens.

B. Type: [120V, 60 Hz,] three wire, permanently lubricated, reversal type designed to be mounted inside roller unless otherwise indicated. Motor amperage determined by manufacturer as required for specific application.

C. Equip with noise silencer, automatic thermal overload protection, integral gears, capacitor, and electric brake to prevent coasting.

D. Limit switches: Pre-set, adjustable switches to automatically stop viewing surface in up or down positions.

2.4 VIEWING SURFACE

A.. Matte White as manufactured by Da-Lite Screen Company, Inc.: Flame retardant, mildew resistant, white, vinyl coated fiberglass screen that can be rolled and cleaned with mild soap and water solution.

1. Gain: 1.0.

2. Viewing angle: 50 degrees.

B. Seams: To the extent possible screen surfaces shall be seamless. Where required by size provide a minimum number of flat, horizontal seams. Vertical seams are not acceptable.

2.5 ELECTRICALLY OPERATED PROJECTION SCREENS

A. Type: Electrically operated, retractable projection screen with rigid metal roller housing motor; Cosmopolitan Electrol Screen as manufactured by Da-Lite Screen Company, Inc.

1. Installation method: Wall mounted with bracket adjustable from 14-1/2 to 24 inches.

2. Case: Hexagonal with flat back case fabricated from 22 gauge embossed steel with steel end caps designed to receive mounting hardware.

a. Case length: As required.

b. Finish: Black enamel paint.

3. Permanently attach screen fabric to roller. Provide bottom of screen with metal rod in pocket.

4. Viewing surface: Matte White

c. Size: 106”inches high by 188” wide.

d. Provide with no masking borders.

2.6 CONTROLS

A. Electric screen control switch: Wall mounted, single motor, 115 volt, 3 position control switch for UP, DOWN, and STOP functions. Provide switch with box and cover plate. [To prevent unauthorized use, equip control with hinged, key- locked, stainless steel cover plate.]

B. Radio frequency remote control: Provide hand held, 3 button, radio frequency transmitter for UP, DOWN, and STOP functions.

2.7 ACCESSORIES

A. Installation hardware: Provide attachment hardware, fasteners, and other components of type, size, and spacing recommended by manufacturer for complete, functional, secure installation of electric screens.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate provision of electric screens with locations of other wall and ceiling mounted components such as visual display boards, casework, structural framing, light fixtures, air diffusers, ducts, and fire sprinklers to eliminate potential conflicts.

B. Coordinate requirements for blocking, [construction of recesses,] and auxiliary structural supports to ensure adequate means for installation of screens.

C. Coordinate requirements for power supply, conduit, and wiring required for electric screen and controls.

D. Prior to installation, verify type and location of power supply.

3.2 INSTALLATION

A. Install screens in accordance with approved shop drawings and manufacturer's installation instructions.

3.3 TESTING AND PROTECTING

A. Operate each screen three times minimum. Ensure screens properly extend and retract and that screen is level and viewing surface plumb when extended. Verify controls, limit

switches, [automatic doors,] and other operating components are functional. Adjust to correct deficiencies.

B. Protect projection screens from damage resulting from subsequent construction activities. Remove and replace damaged screens.

END OF SECTION

SECTION 15051 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Mechanical Sleeve Seals: Modular rubber sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. PVC Pipe: ASTM D 1785, Schedule 40.

2.2 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

2.3 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

2.4 VIBRATION ISOLATION AND SEISMIC CONTROL DEVICES

A. Vibration Supports:

1. Pads: Arranged in single or multiple layers of oil- and water-resistant neoprene of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match supported equipment.

2. Mounts: Double-deflection type, with molded, oil-resistant fiberglass, rubber or neoprene isolator elements with factory-drilled, encapsulated top plate and baseplate. Provide isolator with minimum 0.5-inch (13-mm) <**Insert dimension**> static deflection.

PART 3 - EXECUTION

3.1 MOTOR INSTALLATION

A. Anchor motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions.

3.2 GENERAL PIPING INSTALLATIONS

A. Install piping free of sags and bends.

B. Install fittings for changes in direction and branch connections.

C. Install sleeves for pipes passing through concrete and masonry walls, gypsum board partitions, and concrete floor and roof slabs.

D. Exterior Wall, Pipe Penetrations: Mechanical sleeve seals installed in steel or cast-iron pipes for wall sleeves.

E. Install unions at final connection to each piece of equipment.

F. Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals in water piping.

3.3 GENERAL EQUIPMENT INSTALLATIONS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.4 BASES, SUPPORTS, AND ANCHORAGES

A. Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base to connect concrete base to concrete floor.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

C. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors. Place grout, completely filling equipment bases.

END OF SECTION 15051

SECTION 15052 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Mechanical Sleeve Seals: Modular rubber sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. PVC Pipe: ASTM D 1785, Schedule 40.

2.2 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

2.3 HANGERS AND SUPPORTS

A. Hanger and Pipe Attachments: Factory fabricated with galvanized coatings; nonmetallic coated for hangers in direct contact with copper tubing.

B. Powder-Actuated Fasteners: Threaded-steel stud, with pull-out and shear capacities appropriate for supported loads and building materials where used.

C. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, with pull-out and shear capacities appropriate for supported loads and building materials where used.

2.4 PRESSURE GAGES AND TEST PLUGS

A. Pressure Gages: Direct-mounting, indicating-dial type complying with ASME B40.100. Dry metal case, minimum 2-1/2-inch (63-mm) diameter with red pointer on white face, and plastic

window. Minimum accuracy 3 percent of middle half of range. Range two times operating pressure.

B. Test Plug: Corrosion-resistant brass or stainless-steel body with two self-sealing rubber core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping. Minimum pressure and temperature rating 500 psig at 200 deg F (3450 kPa at 93 deg C).

PART 3 - EXECUTION

3.1 MOTOR INSTALLATION

A. Anchor motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions.

3.2 GENERAL PIPING INSTALLATIONS

A. Install piping free of sags and bends.

B. Install fittings for changes in direction and branch connections.

C. Install sleeves for pipes passing through concrete and masonry walls, gypsum board partitions, and concrete floor and roof slabs.

D. Exterior Wall, Pipe Penetrations: Mechanical sleeve seals installed in steel or cast-iron pipes for wall sleeves.

E. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for sealing pipe penetrations in fire-rated construction.

F. Install unions at final connection to each piece of equipment.

G. Install dielectric unions and flanges to connect piping materials of dissimilar metals in gas piping.

H. Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals in water piping.

3.3 GENERAL EQUIPMENT INSTALLATIONS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.4 BASES, SUPPORTS, AND ANCHORAGES

A. Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base to connect concrete base to concrete floor.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

B. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors. Place grout, completely filling equipment bases.

3.5 HANGERS AND SUPPORTS

A. Comply with MSS SP-69 and MSS SP-89. Install building attachments within concrete or to structural steel.

B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems.

C. Install powder-actuated fasteners and mechanical-expansion anchors in concrete after concrete is cured. Do not use in lightweight concrete or in slabs less than 4 inches (100 mm) thick.

D. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).

2. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
3. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
4. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
5. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).

F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

3.6 VIBRATION ISOLATION AND SEISMIC CONTROL DEVICE INSTALLATION

A. Adjust vibration isolators to allow free movement of equipment limited by restraints.

B. Install resilient bolt isolation washers and bushings on equipment anchor bolts.

C. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

END OF SECTION 15052

SECTION 15053 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Mechanical Sleeve Seals: Modular rubber sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. PVC Pipe: ASTM D 1785, Schedule 40.

2.2 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

2.3 MOTORS

A. Motor Characteristics:
   1. Motors Smaller Than 1/2 HP: Single phase.
   2. Frequency Rating: 60 Hz.
   3. Voltage Rating: NEMA standard voltage for circuit voltage to which motor is connected.
   4. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.
   5. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.
   6. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
   7. Enclosure: Unless otherwise indicated, open dripproof.

2.4 HANGERS AND SUPPORTS

A. Hanger and Pipe Attachments: Factory fabricated with galvanized coatings; nonmetallic coated for hangers in direct contact with copper tubing.

B. Powder-Actuated Fasteners: Threaded-steel stud, with pull-out and shear capacities appropriate for supported loads and building materials where used.

C. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, with pull-out and shear capacities appropriate for supported loads and building materials where used.

2.5 VIBRATION ISOLATION AND SEISMIC CONTROL DEVICES

A. Vibration Supports:

1. Pads: Arranged in single or multiple layers of oil- and water-resistant, neoprene of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match supported equipment.
2. Spring Isolators: Freestanding, laterally stable, restrained open-spring isolators. Provide isolator with minimum 1-inch static deflection.

B. Vibration Hangers:

1. Elastomeric Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Provide isolator with minimum 0.5-inch static deflection.
2. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression. Provide isolator with minimum 1-inch static deflection.

PART 3 - EXECUTION

3.1 MOTOR INSTALLATION

A. Anchor motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions.

3.2 GENERAL PIPING INSTALLATIONS

A. Install piping free of sags and bends.

B. Install fittings for changes in direction and branch connections.

C. Install sleeves for pipes passing through concrete and masonry walls, gypsum board partitions, and concrete floor and roof slabs.

D. Exterior Wall, Pipe Penetrations: Mechanical sleeve seals installed in steel or cast-iron pipes for wall sleeves.

E. Comply with requirements in Division 7 Section "07270 - Firestopping" for sealing pipe penetrations in fire-rated construction.

F. Install unions at final connection to each piece of equipment.

G. Install dielectric unions and flanges to connect piping materials of dissimilar metals in gas piping.

H. Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals in water piping.

3.3 GENERAL EQUIPMENT INSTALLATIONS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.4 BASES, SUPPORTS, AND ANCHORAGES

A. Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to building codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
3. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

B. Mix and install grout for pump and other equipment base plates, and anchors. Place grout, completely filling equipment bases.

3.5 HANGERS AND SUPPORTS

A. Comply with MSS SP-69 and MSS SP-89. Install building attachments within concrete or to structural steel.

B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems.

C. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

D. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 4.

E. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 4.

3.6 VIBRATION ISOLATION AND SEISMIC CONTROL DEVICE INSTALLATION

A. Adjust vibration isolators to allow free movement of equipment limited by restraints.

B. Install resilient bolt isolation washers and bushings on equipment anchor bolts.

C. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

END OF SECTION 15053

SECTION 15082 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Quality Assurance: Labeled with maximum flame-spread index of 25 and maximum smoke-developed index of 50 according to ASTM E 84.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

B. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

C. Mineral-Fiber Blanket Insulation: Comply with ASTM C 553, Type II and ASTM C 1290, Type I.

D. Mineral-Fiber Board Insulation: Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation with factory-applied ASJ.

E. Mineral-Fiber, Preformed Pipe Insulation: Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ.

F. Mineral-Fiber, Pipe and Tank Insulation: Complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB; and having factory-applied ASJ. Nominal density is 2.5 lb/cu. ft. (40 kg/cu. m) or more. Thermal conductivity (k-value) at 100 deg F (55 deg C) is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less.

G. Polyolefin Insulation: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

H. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

I. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

J. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

K. Factory-Applied Jackets: When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

L. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

M. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

PART 3 - EXECUTION

3.1 PIPE INSULATION INSTALLATION

A. Comply with requirements of the Midwest Insulation Contractors Association's "National Commercial & Industrial Insulation Standards" for insulation installation on pipes and equipment.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall, Partition, and Floor Penetrations: Install insulation continuously through penetrations. Seal penetrations. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

D. Flexible Elastomeric Insulation Installation:

1. Seal longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

E. Mineral-Fiber Insulation Installation:

1. Insulation Installation on Straight Pipes and Tubes: Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
2. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
3. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

F. Polyolefin Insulation Installation:

1. Seal split-tube longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of polyolefin pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

G. Interior Piping System Applications: Insulate the following piping systems:

1. Domestic hot water.
2. Recirculated domestic hot water.
3. Roof drain bodies and horizontal rainwater leaders of storm water piping.
4. Exposed water supplies and sanitary drains of fixtures for people with disabilities.

H. Do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Sanitary drainage and vent piping.
3. Drainage piping located in crawlspaces unless otherwise indicated.
4. Chrome-plated pipes and fittings, except for plumbing fixtures for people with disabilities.
5. Piping specialties, including air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.2 INDOOR PIPING INSULATION SCHEDULE

A. Unless otherwise indicated, do not install insulation on the following:

1. Underground piping.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

B. Domestic Cold Water:

1. NPS 1 (DN 25) and Smaller: Insulation shall be one of the following:

   a. Flexible Elastomeric: 3/4 inch (19 mm) thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch (13 mm) thick.

2. NPS 1-1/4 (DN 32) and Larger: Insulation shall be one of the following:

   a. Flexible Elastomeric: 1 inch (25 mm) thick.
   b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

C. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/4 (DN 32) and Smaller: Insulation shall be one of the following:

    a. Flexible Elastomeric: 3/4 inch (19 mm) thick.
    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

2. NPS 1-1/2 (DN 40) and Larger: Insulation shall be one of the following:

    a. Flexible Elastomeric: 1 inch (25 mm) thick.
    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be the following:

    a. Flexible Elastomeric: 1 inch (25 mm) thick.

END OF SECTION 15082

SECTION 15083 - HVAC INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Quality Assurance: Labeled with maximum flame-spread index of 25 and maximum smoke-developed index of 50 according to ASTM E 84.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

B. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

C. Mineral-Fiber Blanket Insulation: Comply with ASTM C 553, Type II and ASTM C 1290, Type I.

D. Mineral-Fiber Board Insulation: Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation with factory-applied ASJ.

E. Mineral-Fiber, Preformed Pipe Insulation: Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ.

F. Mineral-Fiber, Pipe and Tank Insulation: Complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB; and having factory-applied ASJ-(OUTDOOR INSTALLATION) or FSK jacket-(INDOOR INSTALLATION). Nominal density is 2.5 lb/cu. ft. (40 kg/cu. m) or more. Thermal conductivity (k-value) at 100 deg F (55 deg C) is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less.

G. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

H. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

I. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

J. Factory-Applied Jackets: When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

K. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

L. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

A. Comply with requirements of the Midwest Insulation Contractors Association's "National Commercial & Industrial Insulation Standards" for insulation installation on pipes and equipment.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall, Partition, and Floor Penetrations: Install insulation continuously through penetrations. Seal penetrations. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

D. Flexible Elastomeric Insulation Installation:

1. Seal longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

E. Mineral-Fiber Insulation Installation:

1. Insulation Installation on Straight Pipes and Tubes: Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
2. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
3. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
4. Blanket and Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

5. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier.

6. Seal split-tube longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
7. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of polyolefin pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

F. Plenums and Ducts Requiring Insulation:

1. Concealed and exposed supply and outdoor air.
2. Concealed and exposed return air located in nonconditioned space.
3. Concealed and exposed exhaust between isolation damper and penetration of building exterior.

G. Plenums and Ducts Not Insulated:

1. Metal ducts with duct liner.
2. Factory-insulated plenums and casings.
3. Flexible connectors.
4. Vibration-control devices.
5. Factory-insulated access panels and doors.

H. Piping Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawlspaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.2 DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed duct insulation shall be the following:
1. Mineral-Fiber Blanket: 1-1/2 inches thick and 3-lb/cu. ft. (48-kg/cu. m) nominal density.

B. Exposed duct insulation shall be the following:
1. Mineral-Fiber Board: 2 inches (50 mm) thick and 2-lb/cu. ft. (32-kg/cu. m) nominal density.

3.3 HVAC PIPING INSULATION SCHEDULE

A. Chilled Water: Insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.
2. Foamglas as manufacturered by Pittsburgh Corning: 1-1/2" thick.

B. Heating-Hot-Water Supply and Return: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe, Type I: 1 inch (25 mm) thick.

C. Refrigerant Suction and Hot-Gas Piping: Insulation shall be the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.

D. Refrigerant Suction and Hot-Gas Flexible Tubing: Insulation shall be[**one of**] the following:

1. Flexible Elastomeric: 1 inch (25 mm) thick.

E. Dual-Service Heating and Cooling: Mineral-Fiber, Preformed Pipe, Type I: 1 inch (25 mm) thick.

END OF SECTION 15083

SECTION 15111 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL-DUTY VALVES

A. Valve Sizes: Same as upstream piping unless otherwise indicated.

B. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions.

C. End Connections: Threads shall comply with ANSI B1.20.1. Flanges shall comply with ANSI B16.1 for cast-iron valves and with ANSI B16.24 for bronze valves. Solder-joint connections shall comply with ANSI B16.18.

D. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, and 400-psig (2760-kPa) minimum CWP rating.

E. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.

F. Bronze, Swing Check Valves: Class 125, bronze body with bronze disc and seat.

G. Bronze Gate Valves: Class 125, bronze body with rising stem and bronze solid wedge and union-ring bonnet.

H. Bronze-Mounted, Cast-Iron Gate Valves: Class 125, cast-iron body and solid-wedge disc.

I. Bronze Globe Valves: Class 125, bronze body with bronze disc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use gate and ball valves for shutoff duty; globe and ball for throttling duty.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves for each fixture and item of equipment.

D. Install three-valve bypass around each pressure-reducing valve using throttling-type valves.

E. Install valves in horizontal piping with stem at or above center of pipe.

F. Install valves in a position to allow full stem movement.

G. Install check valves for proper direction of flow in horizontal position with hinge pin level.

END OF SECTION 15111

SECTION 15112 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUBMITTALS

A. Product DaSta.

PART 2 - PRODUCTS

2.1 GENERAL-DUTY VALVES

A. Valve Sizes: Same as upstream piping unless otherwise indicated.

B. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions.

C. End Connections: Threads shall comply with ANSI B1.20.1. Flanges shall comply with ANSI B16.1 for cast-iron valves and with ANSI B16.24 for bronze valves. Solder-joint connections shall comply with ANSI B16.18.

D. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, and 600-psig (4140-kPa) CWP rating.

E. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.

F. Bronze, Swing Check Valves: Class 125, bronze body with nonmetallic disc and seat.

G. Bronze Gate Valves: Class 125, bronze body with stem and bronze solid wedge.

H. Bronze Globe Valves: Class 125, bronze body with nonmetallic disc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to full closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage.

E. Do not attempt to repair defective valves. Replace with new valves.

3.2 INSTALLATION

A. Use gate and ball valves for shutoff duty; globe and ball for throttling duty.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves for each fixture and item of equipment.

D. Install three-valve bypass around each pressure-reducing valve using throttling-type valves.

E. Install valves in horizontal piping with stem at or above center of pipe.

F. Install valves in a position to allow full stem movement.

G. Install check valves for proper direction of flow in horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 15112

SECTION 15140 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.

B. Comply with NSF 61 for potable domestic water piping and components.

1.2 SUMMARY

1. Section includes Aboveground domestic water piping, tubing, and fittings.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Hard Copper Tubing: ASTM B 88, Types L and M (ASTM B 88M, Types B and C), water tube, drawn temper with wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

1. Copper Unions: Cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
2. Joining Materials: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder.

B. Special-Duty Valves:

1. Comply with requirements in Division 15 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.
2. Comply with requirements in Division 15 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.
3. CPVC and PVC Union Ball Valves: MSS SP-122, with full-port ball, socket or threaded detachable end connectors, and pressure rating not less than 150 psig (1035 kPa) at 73 deg F (23 deg C).
4. CPVC and PVC Non-Union Ball Valves: MSS SP-122, with full- or reduced-port ball, socket or threaded ends, and pressure rating not less than 150 psig (1035 kPa) at 73 deg F (23 deg C).

C. Transition Fittings: Manufactured piping coupling or specified piping system fitting. Same size as pipes to be joined and pressure rating at least equal to pipes to be joined.

D. Flexible Connectors: Stainless-steel, corrugated-metal tubing with wire-braid covering. Working-pressure rating a minimum of 200 psig (1380 kPa).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for basic piping installation requirements.

B. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for wall penetration systems.

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for pressure gages and Division 15 Section "Domestic Water Piping Specialties" for drain valves and strainers.

D. Install domestic water piping with 0.25 percent slope downward toward drain for horizontal piping and plumb for vertical piping.

E. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

F. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for basic piping joint construction.

1. Soldered Joints: Comply with procedures in ASTM B 828 unless otherwise indicated.

G. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for pipe hanger and support devices.

H. Support vertical piping at each floor.

I. Install piping straight, level, plumb, and without sags or bends.

3.2 INSPECTING AND CLEANING

A. Inspect and test piping systems as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

B. Clean and disinfect potable and non-potable domestic water piping by filling system with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

3.3 PIPING SCHEDULE

A. Underground, Service Entrance Piping: Soft copper tubing.

B. Aboveground Distribution Piping: Type L (Type B), hard copper tubing.

3.4 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Install gate valves close to main on each branch and riser serving two or more plumbing fixtures or equipment connections and where indicated.

C. Install gate or ball valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated.

D. CPVC and PVC ball, butterfly, and check valves may be used in matching piping materials.

E. Install drain valve at base of each riser, at low points of horizontal runs, and where required to drain water distribution piping system.

F. Install swing check valve on discharge side of each pump and elsewhere as indicated.

G. Install ball valves in each hot-water circulating loop and discharge side of each pump.

END OF SECTION 15140

SECTION 15145 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Pipe-Applied, Atmospheric Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

B. Hose Connection Vacuum Breakers: ASSE 1011, nickel-plated bronze, with nonremovable and manual drain features and garden-hose threaded connection.

C. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013.

D. Water Regulators: ASSE 1003.

E. Balancing Valves: MSS SP-110 for two-piece, copper-alloy ball valves, with memory stop.

F. Thermostatic Mixing Valves: Manually adjustable, bronze body. Include check stop and union on hot- and cold-water-supply inlets.

G. Hose Bibbs: Bronze body in rough-bronze finish, with removable composition disc, threaded or soldered inlet, garden-hose threaded outlet, and loose-key handle.

H. Wall Hydrant: recessed, nonfreeze, automatic draining, antibackflow type, with key operator and threaded inlet, garden-hose threaded outlet, and rough-bronze finish.

I. Ball-Valve-Type, Hose-End Drain Valves: MSS SP-110, with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

J. Stop-and-Waste Drain Valves: MSS SP-110 for ball valves or MSS SP-80 for gate valves.

K. Water Hammer Arrester: Bellows or piston type with pressurized cushioning chamber.

L. Strainers: Y-pattern, bronze body, 125-psig (860-kPa) minimum steam working pressure.

M. Water Filters: Cartridge type, including housing, fittings, filter cartridges, and cartridge end caps.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers at each water-supply connection to mechanical equipment and where required by authorities having jurisdiction.

B. Install hose bibbs with integral or field-installed vacuum breaker.

END OF SECTION 15145

SECTION 15150 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Minimum Pressure Requirement for Soil, Waste, and Vent: 10-foot head of water (30 kPa).

B. Comply with NSF 14, "Plastic Piping Components and Related Materials," for plastic piping components.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

A. Hub-and-Spigot Cast-Iron Soil Pipe and Fittings: ASTM A 74, Service class; ASTM C 564 rubber gaskets.

B. Hubless Cast-Iron Soil Pipe and Fittings: ASTM A 888 or CISPI 301, with ASTM C 1277 shielded couplings.

C. PVC Plastic, DWV Pipe and Fittings: ASTM D 2665, Schedule 40, plain ends with PVC socket-type, DWV pipe fittings.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for basic piping installation requirements.

B. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

C. Install wall penetration system at each pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for wall penetration systems.

1. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

D. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be

used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

E. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

G. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

H. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

J. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for basic piping joint construction.

K. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure unless otherwise indicated.

L. Comply with requirements in Division 15 Section "Common Work Results for Plumbing" for pipe hanger and support devices.

3.2 PIPE SCHEDULE

A. Aboveground Applications: Hub-and-spigot, cast-iron soil pipe and fittings PVC plastic, DWV pipe and fittings with solvent-cemented joints.

B. Belowground Applications: Hub-and-spigot, cast-iron soil pipe and fittings PVC plastic, DWV pipe and drainage-pattern fittings with cemented joints.

END OF SECTION 15150

SECTION 15181 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Summary: Cooling water piping and condensate drain piping.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Hard Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B) with ASME B16.22 wrought-copper solder fittings and ASTM B 32, 95-5 tin antimony solder.

B. PVC Pipe: ASTM D 1785, Schedule 40, plain ends with ASTM F 438, socket-type solvent welding fittings.

C. Steel Pipe: ASTM A 53, Schedule 40, plain ends with malleable-iron threaded fittings, Class 150.

D. Unions: ASME B16.39, malleable-iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

E. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150-psig (1035-kPa) minimum working pressure, 250 deg F (121 deg C) maximum operating temperature.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, ends.

2.2 SPECIAL-DUTY VALVES

A. Calibrated Plug Valves: 125-psig (860-kPa) water working pressure, 250 deg F (121 deg C) maximum operating temperature; bronze body with calibrated orifice. Provide with connections for portable differential pressure meter with integral check valves and seals. Valve shall have integral pointer and calibrated scale to register degree of valve opening.

B. Pressure-Reducing Valves: Diaphragm-operated, cast-iron or brass-body valve, with low-inlet pressure check valve, inlet strainer removable without system shutdown, and noncorrosive valve seat and stem.

C. Safety Relief Valves: Brass or bronze body with brass and rubber, wetted, internal working parts; to suit system pressure and heat capacity; according to ASME Boiler and Pressure Vessel Code: Section IV.

2.3 HYDRONIC SPECIALTIES

A. Manual Air Vent: Bronze body and nonferrous internal parts; 150-psig (1035-kPa) working pressure, 225 deg F (107 deg C) operating temperature; manually operated with screwdriver or thumbscrew; with NPS 1/8 (DN 6) discharge connection and NPS 1/2 (DN 15) inlet connection.

B. Diaphragm-Type Compression Tanks: Welded carbon steel, 125-psig (860-kPa) working pressure, 375 deg F (190 deg C) maximum operating temperature. Separate air charge from system water to maintain design expansion capacity, by means of a flexible diaphragm securely sealed into tank. Provide taps for pressure gage and air charging fitting, and drain fitting. Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles. Tank, with taps and supports, shall be constructed, tested, and labeled according to ASME Pressure Vessel Code: Section VIII.

C. Chemical Feeder: 5-gal. (19-L), bypass-type, welded steel; 125-psig (860-kPa) working pressure; complete with fill funnel and inlet, outlet, and drain valves. Furnish chemicals specially formulated to prevent accumulation of scale and corrosion in piping system and connected equipment, developed based on analysis of makeup water.

D. Y-Pattern Strainers: 125-psig (860-kPa) working pressure; cast-iron body (ASTM A 126, Class B), flanged ends for NPS 2-1/2 (DN 65) and larger, threaded connections for NPS 2 (DN 50) and smaller, bolted cover, perforated Type 304 stainless-steel basket, and bottom drain connection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with requirements in Division 15 Section "Common Work Results for HVAC" for basic piping installation requirements.

B. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 15 Section "Common Work Results for HVAC" for wall penetration systems.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping free of sags and bends and install fittings for changes in direction and branch connections.

E. Use the fewest number of joints belowground and within floor slabs.

F. Install piping at a uniform slope of 0.2 percent upward in the direction of flow.

G. Make reductions in pipe sizes using eccentric reducer fitting installed with level side up.

H. Install branch connections to mains using tee fittings in main with takeoff out the bottom of the main, except for up-feed risers, which shall have swing joint and takeoff out the top of the main line.

I. Install unions in pipes adjacent to each valve, at final connections with each piece of equipment, and elsewhere as indicated.

J. Install flexible connectors at inlet and discharge connections to pumps (except in-line pumps) and other vibration-producing equipment.

K. Remove stems, seats, and packing of valves and accessible internal parts at piping specialties before soldering or brazing.

3.2 VALVE INSTALLATIONS

A. Shutoff Duty: Use gate or ball valves.

B. Throttling Duty: Use globe or ball valves.

C. Install shutoff-duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, and elsewhere as indicated.

D. Install throttling-duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated.

E. Install calibrated plug valves on the outlet of each heating or cooling element and elsewhere as required to facilitate system balancing.

F. Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple and cap.

G. Install check valves on each pump discharge and elsewhere as required to control flow direction.

H. Install safety relief valves on hot-water generators and elsewhere as required by authorities having jurisdiction. Pipe discharge to floor drain without valves.

I. Install manual air vents at high points in the system, at heat-transfer coils, and elsewhere as required for system air venting.

J. Run piping from boiler air vent connection or air separator to compression tank with 1/4 inch per foot (1:50) upward slope towards tank. Connect boiler outlet piping.

K. Install valves with stem up. Allow clearance above stem for check mechanism removal.

3.3 SPECIALTIES INSTALLATIONS

A. Install chemical feeders in each hydronic system in upright position with top of funnel not more than 48 inches (1200 mm) above floor. Install feeder across pump or in bypass line, off main using ball valves on each side of feeder, and in the main between bypass connections. Pipe drain, with ball valve, to nearest equipment drain.

B. Install diaphragm-type compression tanks on floor. Vent and purge air from hydronic system; charge tank with proper air charge to suit system design requirements.

C. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated.

3.4 TESTING, ADJUSTING, AND BALANCING

A. Clean and flush hydronic piping systems. Remove, clean, and replace strainer screens.

B. Hydrostatically test completed piping at a pressure one and one-half times operating pressure. Isolate equipment before testing piping. Repair leaks and retest piping until there are no leaks.

C. Balance water flow as required by Division 15 Section "Testing, Adjusting, and Balancing."

3.5 PIPING SCHEDULE

A. Hot and Chilled Water, NPS 2 (DN 50) and Smaller:

1. Aboveground: Drawn-temper copper tubing with soldered joints, or steel pipe with threaded joints.
2. Aboveground: Steel pipe with threaded joints.
3. Aboveground: CPVC pipe and fittings with solvent welded joints.
4. Belowground or within Slabs: Annealed-temper copper tubing with soldered joints.

B. Condensate Drain Lines: Drawn-temper copper tubing with soldered joints or PVC pipe with solvent-welded joints.

END OF SECTION 15181

SECTION 15183 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Comply with ASME B31.5, "Refrigerant Piping," and with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

PART 2 - PRODUCTS

2.1 TUBES AND FITTINGS

A. Copper Tube: ASTM B 88, Types K and L (ASTM B 88M, Types A and B) and ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

D. Brazing Filler Metals: AWS A5.8.

2.2 VALVES

A. Thermostatic Expansion Valve: Comply with ARI 750; forged brass or steel body, stainless-steel internal parts, copper tubing filled with refrigerant charge for 40 deg F (5 deg C) suction temperature; 450-psig (3100-kPa) working pressure, and 240 deg F (116 deg C) operating temperature.

B. Solenoid Valves: Comply with ARI 760; 240 deg F (116 deg C) temperature rating, 400-psig (2760-kPa) working pressure, 240 deg F (116 deg C) operating temperature; and 24-V normally closed holding coil.

2.3 REFRIGERANT PIPING SPECIALTIES

A. Strainers: Welded steel with corrosion-resistant coating and 100-mesh stainless-steel screen with socket ends; 500-psig (3450-kPa) working pressure and 275 deg F (135 deg C) working temperature.

B. Moisture/Liquid Indicators: 500-psig (3450-kPa) operating pressure, 240 deg F (116 deg C) operating temperature; with replaceable, polished, optical viewing window and color-coded moisture indicator.

C. Filter Dryers: 500-psig (3450-kPa) operating pressure; 240 deg F (116 deg C) operating temperature; withgaskets, and filter-dryer cartridge.

D. Mufflers: Welded steel with corrosion-resistant coating and socket ends; 500-psig (3450-kPa) operating pressure; 240 deg F (116 deg C) operating temperature.

E. Refrigerant: ASHRAE 34, R-410A.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with requirements in Division 15 Section "Common Work Results for HVAC" for basic piping installation requirements.

B. Install wall penetration system at each pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 15 Section "Common Work Results for HVAC" for wall penetration systems.

C. Install refrigerant piping and charge with refrigerant according to ASHRAE 15.

D. Belowground, install copper tubing in PVC conduit. Vent conduit outdoors.

E. Insulate suction lines to comply with Division 15 Section "HVAC Insulation."

F. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

G. Install solenoid valves upstream from each thermostatic expansion valve. Install solenoid valves in horizontal lines with coil at top.

H. Install thermostatic expansion valves as close as possible to distributors on evaporator coils.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to solenoid valves, thermostatic expansion valves, and compressors unless they are furnished as an integral assembly for device being protected:

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

3.2 PIPING SCHEDULE FOR REFRIGERANT R-22

A. Suction Lines: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.3 PIPING APPLICATIONS FOR REFRIGERANT R-407C.

A. Suction Lines: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.4 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

END OF SECTION 15183

SECTION 15185 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data. Include certified pump-performance curves, furnished specialties, motor horsepower and electrical characteristics.

B. Comply with UL 778 for motor-operated water pumps.

1.2 SUBMITTALS

A. Provide manufacturer's literature for all products specified in this Section, which will be installed under this project.

B. Provide performance curves for all pumps. Plot the specified operating point for each pump on its respective curve.

C. Provide complete literature for all components of packaged systems. These include pump performance, heat exchanger calculations, expansion tank capacity, data for all accessories and valves and complete wiring diagrams specific to the exact unit to be supplied. The wiring diagram shall indicate all required field and factory wiring.

PART 2 - PRODUCTS

2.1 HYDRONIC PUMPS

A. Separately Coupled, Vertical, In-Line Centrifugal Pumps: Factory-assembled and -tested, overhung impeller, designed for installation with pump and motor shafts mounted vertically. Rated for 175-psig (1200-kPa) minimum working pressure and a continuous water temperature of 225 deg F (107 deg C).

1. Available Products:

a. As specified in schedule.

b. Armstrong

c. Bell and Gossett

2. Casing: Pump shall be constructed of ASTM A48 class 30 cast iron. The pump casing shall be drilled and tapped for gauge ports on both the suction and discharge connections.
3. Impeller: The impeller shall be ASTM C87500 or C89833 bronze and hydraulically balanced. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be

fitted with a holding taper and left handed 431 series stainless steel bolt. The impeller shall be cast by the hydraulically efficient lost foam technique to ensure repeatability of high quality.

4. Pump Shaft: The pump shall incorporate a dry shaft design to prevent the circulating fluid from contacting the shaft. The pump shaft shall be AISI 1045 carbon steel with field replaceable copper nickel 90-10 shaft sleeve. In order to improve serviceability and reduce the cost of ownership the shaft sleeve must be slip on (press on not allowable) and must be easily replaced in the field.
5. Mechanical Seal: The pump shall be fitted with a single mechanical seal, with EPT elastomers and Carbon/Ceramic faces, rated up to 250ºF. The pump shall be coupled to a NEMA 56C face motor with threaded on shaft extension.
6. Pump Bearings: Permanently lubricated ball bearings.

2.2 MOTORS

A. 1/2 to 3 HP (373 to 2238 W): Permanently lubricated ball bearings.

B. 5 HP (3.73 kW) and Larger: Grease-lubricated ball bearings.

C. Motor shall be non-overloading within full range of pump performance.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install pumps with access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

B. Support pumps and piping so weight of piping is not supported by pump volute unless specifically allowed by pump manufacturer.

C. Install electrical connections for power, controls, and devices.

D. Suspend in-line pumps independent from piping. Use continuous-thread hanger rods and vibration isolation hangers. Fabricate brackets or supports as required for pumps.

E. Install vertical in-line pumps on concrete bases.

F. Connect piping with valves that are at least the same size as piping connecting to pumps.

G. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

H. Install shutoff valve and strainer on suction side of pumps.

I. Install nonslam check valve and throttling valve on discharge side of pumps.

J. Pumps shall NOT be run dry to check rotation.

END OF SECTION 15185

SECTION 15410 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data for each type of plumbing fixture, including trim, fittings, accessories, appliances, appurtenances, equipment, and supports.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for fixture materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 WATER CLOSET

A. Vitreous-China Water Closet: Elongated, siphon-jet type, floor-mounted, floor outlet with flushometer valve.

1. Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:

a. Kohler

b. American Standard

c. TOTO

2. Design Consumption: Per Plumbing Schedule.

B. Toilet Seat: Elongated, solid plastic open front with cover with bumpers and hardware, Commercial, Heavy-Duty class.

1. Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:

a. Kohler

b. American Standard

c. TOTO

2. Flush Valve

a. Exposed chrome plated brass electronic sensor flush valve with mechanical override push button for alternative operations.
b. The valve is powered by a 9VDC battery with expected 4 year battery life on 50,000 activations per year. Sensor range is adjustable either manually or by use of a remote control. Other sensor features include low battery indicator light and 24 hour courtesy flush (owner options).
c. The flush valve shall incorporate a filtered bypass, high back pressure vacuum breaker, adjustable tailpiece, spud coupling and flange for top spud connection.
d. Control stop shall have internal siphon-guard protection, vandal resistant stop cap, sweat solder kit, and cast wall flange with set screw. All internal and external gaskets and seals are chloramine resistant.

Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:

e. Kohler

f. American Standard

g. TOTO

2.2 URINAL

A. Vitreous-China Urinal: Accessible, wall-mounting, back-outlet, siphon-jet type.

1. Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:

a. Kohler

b. American Standard

c. TOTO

2. Design Consumption: 0.125 GPF.

B. Flushometer Valve:
1. Flush Valve
a. Exposed chrome plated brass electronic sensor flush valve with mechanical override push button for alternative operations.
b. The valve is powered by a 9VDC battery with expected 4 year battery life on 50,000 activations per year. Sensor range is adjustable either manually or by use of a remote control. Other sensor features include low battery indicator light and 24 hour courtesy flush (owner options).
c. The flush valve shall incorporate a filtered bypass, high back pressure vacuum breaker, adjustable tailpiece, spud coupling and flange for top spud connection.

d. Control stop shall have internal siphon-guard protection, vandal resistant stop cap, sweat solder kit, and cast wall flange with set screw. All internal and external gaskets and seals are chloramine resistant.

C. Fixture Support: Type I, with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular steel uprights with feet.

2.3 LAVATORY

A. The wall-mount lavatory shall be made of vitreous china. Product shall be 21-15/16 3 (55.7 cm) in length and 19-3/4 3 (50.2 cm) in width and available with 8 3 (20.3 cm) centers (-8), 4 3 (10.2 cm) centers (-4), or single-hole (-1). Product shall feature an overflow and hanger and be drilled for a concealed arm carrier. Product shall have an optional soap dispenser hole on left (-L) or right (-R) (single-hole models only). Lavatory shall be Kohler Model K-1999-8-N.

1. Basis-of-Design Product: Product indicated on Drawings or comparable product.

2. Faucets: ADA Compliant, Sensor Activated, 6 VDC, Chrome Plated Brass, Gooseneck Hand Washing Faucet with the following features:
   a. Splash-proof Circuit Control Module
   b. Adjustable Infrared Sensor Range
   c. 36" (914 mm) Long Sensor Cable
   d. 24" (610 mm) Long Flex Hose
   e. Filtered Solenoid Valve with serviceable Strainer Filter
   f. Bak-Chek® Tee for Hot/Cold Supply
   g. 6 VDC Plug-in Adapter (Model SF-2200 only)
   h. Laminar Spray Head
   i. Four (4) AA-size Batteries
   j. Appropriate Mounting Hardware
   k. Trim Plate Kit for 4" (102 mm) Centerset Sink

B. Trap: Chrome-plated, with slip-joint inlet and wall flange.

C. Supply and Drain Insulation: Soft-plastic covering; removable at stops.

D. Fixture Support: Concealed arm for wall-mounting, lavatory-type fixture. Include rectangular steel uprights and feet.

2.4 SINK

A. The kitchen sink shall be 33" (83.8 cm) in length, 22″ (55.9 cm) in width. Sink shall be made of 18-gauge stainless steel. Sink shall be under counter or self-rimming. Sink shall be double equal compartments. Sink shall include installation hardware. Sink shall be Kohler Model K-3820-NA.

B. Faucet: Solid brass. Maximum 2.5-gpm (0.16-L/s) flow rate.

1. Basis-of-Design Product: Product indicated on Drawings Kohler or comparable product by one of the following:

   a. TOTO

   b. American Standard

   c. Kohler

2. Type: Center set with inlets on 4-inch (102-mm) centers, with spray.
3. Finish: Polished chrome-plate.
4. Handle(s): Single-lever toggle.
5. Spout: Swing with aerator 2-gpm (0.13-L/s) laminar flow.

2.5 SERVICE SINK

A. Enameled, Cast-Iron, Service Sink: Floor-mounting type.

   1. Basis-of-Design Product: zurn or comparable product.

B. Faucet: Widespread, solid brass, chrome plated, with supplies on 8-inch (203-mm) centers. Wall braced spout with integral vacuum breaker, pail hook, and hose-thread outlet.

   1. Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:

      a. Kohler

      b. Zurn

      c. American Standard

C. Mounting: Floor.

D. Rim Guard: Manufacturer's standard.

E. Trap Standard: NPS 3 (DN 80), enameled, with cleanout, and floor flange.

F. Drain: NPS 3 (DN 80) with grid strainer.

PART 3 - EXECUTION

3.1 INSTALLATIONS

A. Install fitting insulation kits on fixtures for people with disabilities.

B. Install fixtures with flanges and gasket seals.

C. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

D. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

E. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

F. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

G. Fasten wall-mounted fittings to reinforcement built into walls.

H. Fasten counter-mounting plumbing fixtures to casework.

I. Secure supplies to supports or substrate within pipe space behind fixture.

J. Set shower receptors and mop basins in leveling bed of cement grout.

K. Install individual supply inlets, supply stops, supply risers, and tubular brass traps with cleanouts at fixture.

L. Install water-supply stop valves in accessible locations.

M. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes unless otherwise indicated.

N. Install disposers in sink outlets. Install switch where indicated, or in wall adjacent to sink if location is not indicated.

O. Install hot-water dispensers in back top surface of sink or in counter with spout over sink.

P. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

Q. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

R. Install piping connections between plumbing fixtures and piping systems and plumbing equipment. Install insulation on supplies and drains of fixtures for people with disabilities.

S. Ground equipment.

END OF SECTION 15410

SECTION 15485 - ELECTRIC, DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Comply with requirements of applicable NSF, AWWA, or FDA and EPA regulatory standards for tasteless and odorless, potable-water-tank linings.

C. Comply with performance efficiencies prescribed in ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings."

D. Warranties: Submit a written warranty executed by manufacturer agreeing to repair or replace water heaters that fail in materials or workmanship within five years from date of Substantial Completion. Failures include, but are not limited to, tanks and elements.

PART 2 - PRODUCTS

2.1 ELECTRIC WATER HEATERS

A. Products:

1. EEMAX Tankless Water Heater

B. Flow-Control, Instantaneous Electric Water Heaters: UL 499, 0.5-gal. (1.89-L) capacity; with 150-psig (1035-kPa) working-pressure rating; 208 volts, 750 watts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install vacuum relief valves in cold-water-inlet piping.

B. Install shutoff valves and unions at hot- and cold-water piping connections.

C. Make piping connections with dielectric fittings where dissimilar piping materials are joined.

D. Electrically ground units according to authorities having jurisdiction.

END OF SECTION 15485

SECTION 15629 - SCROLL WATER CHILLERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. ARI Certification: Certify chiller according to ARI 590 certification program.

C. ARI Rating: Rate water chiller performance according to requirements in ARI 550/590, "Water Chilling Packages Using the Vapor Compression Cycle."

D. ASHRAE Compliance: ASHRAE 15 for safety code for mechanical refrigeration.

E. ASME Compliance: Fabricate and stamp water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code.

F. Warranties: Submit written warranty agreeing to repair or replace refrigeration components that fail within five years after Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:

1. Carrier; a United Technologies Company.
2. McQuay International.
3. Trane Company (The).
4. YORK International Corporation.

2.2 PACKAGED WATER CHILLERS

A. Description: Factory-assembled and run-tested water chiller complete with base and frame, condenser casing, compressors, compressor motors and motor controllers, evaporator, condenser coils, condenser fans and motors, electrical power, controls, and accessories.

B. Fabricate base, frame, and attachment to water chiller components strong enough to resist movement during a seismic event when water chiller base is anchored to field support structure.

C. Cabinet:

1. Frame shall be of heavy-gage, galvanized steel.
2. Exterior panels shall be galvanized steel with a baked enamel powder or pre-painted finish.
3. Cabinet shall be capable of withstanding 500-hour salt spray test in accordance with the ASTM (U.S.A.) B-117 standard.

D. Compressors:
1. Fully hermetic, direct-drive, scroll type compressors.
2. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have either internal line break thermal and current overload protection or external current overload modules with compressor temperature sensors.
3. Compressors shall be mounted on rubber in shear vibration isolators.
4. Staging of compressors shall provide unloading capability. Digital compressor unloading control shall be available as an option.

E. Compressor Motors: High-torque, four-pole induction type with inherent thermal-overload protection on each phase.

F. Refrigeration:

1. Refrigerant: R-410a. Classified as Safety Group A1 according to ASHRAE 34.

2. Refrigerant circuit components shall include filter drier, moisture indicating sight glass, electronic expansion device, discharge and liquid service valves (sizes 070-090 only) and complete operating charge of sides both refrigerant R-410A and compressor oil.

G. Evaporator: Direct-expansion shell-and-tube design with fluid flowing through the shell and refrigerant flowing through the tubes within the shell.

1. Steel shell and copper tube assembly, ASME labeled.
2. Electric trace with thermostat on independent 120-V circuit.

H. Air-Cooled Condenser:
1. Coil shall be air-cooled Novation® heat exchanger technology with microchannel (MCHX) coils and shall have a series of flat tubes containing a series of multiple, parallel flow microchannels layered between the refrigerant manifolds. Coils shall consist of a two-pass arrangement. Coil construction shall consist of aluminum alloys for fins, tubes, and manifolds in combination with a corrosion-resistant coating.
2. Tubes shall be cleaned, dehydrated, and sealed.
3. Assembled condenser coils shall be leak tested and pressure tested at 656 psig (4522 kPa).

I. Controls: Manufacturer's standard microprocessor-based chiller controls; unit mounted, and factory wired with a single-point power connection and separate control circuit.
1. Unit controls shall include the following minimum components:
   a. Microprocessor with non-volatile memory. Battery backup system shall not be accepted.
   b. Separate terminal block for power and controls.

c. Control transformer to serve all controllers, relays, and control components.
d. ON/OFF control switch.
e. Replaceable solid-state controllers.
f. Pressure sensors shall be installed to measure suction and discharge pressure for each circuit. Thermistors shall be installed to measure cooler entering and leaving fluid temperatures, outdoor ambient temperature, and suction temperature. Provision for field installation of accessory sensor to measure compressor return gas temperature.
g. Unit controls shall include the following functions:
    1) Automatic circuit lead/lag for dual circuit chillers.
    2) Hermetic scroll compressors are maintenance free and protected by an auto-adaptive control that minimizes compressor wear.
    3) Capacity control based on leaving chilled fluid temperature and compensated by rate of change of return-fluid temperature with temperature set point accuracy to 0.1° F (0.06° C). Limiting the chilled fluid temperature pulldown rate at start-up to an adjustable range of 0.2° F to 2° F (0.11° C to 1.1° C) per minute to prevent excessive demand spikes at start-up.
    4) Seven-day time schedule.
    5) Leaving chilled fluid temperature reset from return fluid and outside air temperature.
    6) Chilled water pump start/stop control and primary/standby sequencing to ensure equal pump run time.
    7) Dual chiller control for parallel chiller applications without addition of hardware modules and control panels (additional thermistors and wells are required).
    8) Timed maintenance scheduling to signal maintenance activities for pumps, condenser coil cleanings, strainer maintenance and user-defined maintenance activities.
    9) Low ambient protection to energize cooler and hydronic system heaters.
    10) Periodic pump start to ensure pump seals are properly maintained during off-season periods.
    11) Single step demand limit control activated by remote contact closure.
    12) Nighttime sound mode to reduce the sound of the machine by a user-defined schedule.

2. Diagnostics:
    a. The control panel shall include, as standard, a scrolling marquee display capable of indicating the safety lockout condition by displaying a code for which an explanation may be scrolled at the display.
    b. Information included for display shall be:
        1) Compressor lockout.
        2) Loss of charge.
        3) Low fluid flow.
        4) Cooler freeze protection.
        5) Cooler set point.
        6) Chilled water reset parameters.
        7) Thermistor and transducer malfunction.

8) Entering and leaving-fluid temperature.
9) Compressor suction temperature.
10) Evaporator and condenser pressure.
11) System refrigerant temperatures.
12) Chiller run hours.
13) Compressor run hours.
14) Compressor number of starts.
15) Low superheat.
16) Time of day:
    a) Display module, in conjunction with the microprocessor, must also be capable of displaying the output (results) of a service test. Service test shall verify operation of every switch, thermistor, fan, and compressor before chiller is started.
    b) Diagnostics shall include the ability to review a list of the 20 most recent alarms with clear language descriptions of the alarm event. Display of alarm codes without the ability for clear language descriptions shall be prohibited.
    c) An alarm history buffer shall allow the user to store no less than 20 alarm events with clear language descriptions, time and date stamp event entry.
    d) The chiller controller shall include multiple connection ports for communicating with the local equipment network, the Carrier Comfort Network® (CCN) system and access to chiller control functions from any point on the chiller.
    e) The control system shall allow software upgrade without the need for new hardware modules.

3. Safeties:
    a. Unit shall be equipped with thermistors and all necessary components in conjunction with the control system to provide the unit with the following protections:
        1) Loss of refrigerant charge.
        2) Reverse rotation.
        3) Low chilled fluid temperature.
        4) Thermal overload.
        5) High pressure.
        6) Electrical overload.
        7) Loss of phase.

J. Fan Motors:
1. Condenser fans shall be direct drive Aero-Acoustic™ type, discharging air vertically upward.
2. All condenser fan motors shall be totally enclosed 3-phase type with permanently lubricated ball bearings, class F insulation and internal, automatic reset thermal overload protection or manual reset calibrated circuit breakers.
3. Shafts shall have inherent corrosion resistance.
4. Fan blades shall be statically and dynamically balanced.

5. Condenser fan openings shall be equipped with PVC coated steel wire safety guards.

K. Electrical Requirements:
1. Unit/module primary electrical power supply shall enter the unit at a single electrical box (includes option for dual point connection on sizes 070-090).
2. Unit shall operate on 3-phase power at the voltage shown in the equipment schedule.
3. Control points shall be accessed through terminal block.
4. Unit shall be shipped with factory control and power wiring installed.

L. Chilled Water Circuit:
1. Chilled water circuit shall be rated for 300 psig (2068 kPa). Units with optional pump package are rated for 150 psig (1034 kPa) working pressure.
2. Solid-state flow monitor with integral relay shall be factory installed and wired.

M. Special Features:
1. Low-Ambient Operation:
a. Unit shall be capable of operating down to -20 F (-29 C) with the addition of the field or factory-installed solid-state Motormaster® V control with condenser coil temperature sensor. In addition, adequate field-supplied antifreeze with suitable corrosion inhibitor protection shall be field-installed in the evaporator circuit. Additional components shall be required and used in conjunction with the low ambient device. Components include field-installed wind baffles. If significant low-load operation is anticipated, then hot gas bypass is recommended. Motormaster® V control is standard on sizes 010 and 015.
b. NOTE: The motors associated with Motormaster® V fan will be open type and shall have class B insulation.
c. Optional E-Coated MCHX Condenser Coil:
1) E-coated aluminum microchannel coils shall have a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers. Coating process shall ensure complete coil encapsulation, including all exposed fin edges. E-coat thickness of 0.8 to 1.2 mil with top coat having a uniform dry film thickness from 1.0 to 2.0 mil on all external coil surface areas, including fin edges, shall be provided. E-coated coils shall have superior hardness characteristics of 2H per ASTM D3363-00 and cross-hatch adhesion of 4B-5B per ASTM D3359-02. E-coated products shall have superior impact resistance with no cracking, chipping or peeling per NSF/ANSI 51-2002 Method 10.2 (U.S.A. Standards).
2) Remote Enhanced Display:
a) Unit shall be supplied with indoor-mounted, remote, 40-character per line, 16-line display panel for field installation.
3) Vibration Isolation:
a) Vibration isolation pads shall be supplied for field installation at unit mounting points. Pads shall help to reduce vibration transmission into the occupied space.
4) BACnet Communication Option:

a) Shall provide factory-installed communication capability with a BACnet MS/TP network. Allows integration with i-Vu® Open control system or a BACnet building automation system.

5) GFI Convenience Outlet:

a) Shall be factory or field installed to provide the chiller with a 4 amp GFI receptacle. The receptacle shall have independent fuse protection. The convenience outlet is a 115-v female receptacle.

6) Freeze Protection Cooler Heaters:

a) Cooler heaters shall provide protection from cooler freeze-up to -20 F (-29 C).

7) Digital Compressor Option:

a) Shall provide a factory-installed digital compressor to provide incremental steps for tighter temperature control (not available on size 018 units).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install chillers level and plumb, and anchor to base. Maintain recommended clearances.

B. Install flexible pipe connections for chillers mounted on vibration isolators.

C. Install shutoff valves at chiller inlet and outlet connections.

D. Install electrical devices, including remote flow switches and remote chiller control panel. Comply with NFPA 70.

END OF SECTION 15629

SECTION 15763 - FAN-COIL UNITS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data, including color charts for cabinet finishes.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED UNITS

A. Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:
   1. Titus
   2. Trane
   3. McQuay
   4. Envirotec

B. Description: Factory-packaged and -tested units rated according to ARI 440, ASHRAE 33, and UL 1995.

C. Coil Section Insulation: 1-inch (25-mm) thick, foil faced, coated glass fiber complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.

   1. Fire-Hazard Classification: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.

D. Main and Auxiliary Drain Pans: Stainless Steel formed to slope from all directions to the drain connection as required by ASHRAE 62.

E. Chassis: Galvanized steel where exposed to moisture.

Cabinet: Removable side panels shall be provided for access to the fan/motor assembly. Access panels shall be easily removable with hex key tool on vertical unit, and without tools on horizontal unit. A double-sloped drain pan shall be constructed of stainless steel, extending under the full length and width of the coil(s) with a 3/4-in. male nominal pipe thread stainless steel drain connection and 1/2-in. male NPT stainless secondary drain connection (cap when not required). The outside surface of the drain pan shall be insulated with 1/8-in. closed cell insulation. Drain pan is removable from cabinet from same end as coil connections for ease of cleaning.

F. Vertical Unit Front Panels: Removable, steel, with [**integral stamped**] [**polyethylene**] [**steel**] discharge grille and channel-formed edges, cam fasteners, and insulation on back of panel.
   1. Horizontal Unit Bottom Panels: Fastened to unit with cam fasteners and hinge and attached with safety chain; with [**integral stamped**] [**cast-aluminum**] discharge grilles.
   2. Stack Unit Discharge and Return Grille: Aluminum double-deflection discharge grille, and louvered- or panel-type return grille; color as selected by Architect from manufacturer's [**standard**] [**custom**] colors. Return grille shall provide maintenance access to fan-coil unit.
   3. Steel recessing flanges for recessing fan-coil units into ceiling or wall.

G. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm), rated for a minimum working pressure of 200 psig (1378 kPa) and a maximum entering-water temperature of 220 deg F (104 deg C). Include manual air vent and drain valve.

H. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

I. Accessories:
   1. Steel recessing flanges for recessing fan-coil units into ceiling or wall.
   2. Filters: 2-inch- thick, throwaway pleated filters. Provide external filter racks with unit if not a factory supplied option.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb and firmly anchored.

B. Connect to supply and return piping with shutoff valve and union at each connection.

C. Connect units to wiring systems and to ground.

END OF SECTION 15763

SECTION 15810 - DUCTS AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data for fire and smoke dampers and Shop Drawings detailing duct layout and including locations and types of duct accessories, duct sizes, transitions, radius and vaned elbows, special supports details, and inlets and outlet types and locations.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

C. Comply with NFPA 96 for ducts connected to commercial kitchen hoods.

D. Comply with UL 181 for ducts and closures.

PART 2 - PRODUCTS

2.1 DUCTS

A. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 (Z180) hot-dip galvanized coating.

B. Joint and Seam Tape, and Sealant: Comply with UL 181A.

C. Rectangular Metal Duct Fabrication: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.

1. Thickness: 1 inch (25 mm).
2. Airstream surface coated with an antimicrobial erosion-resistant coating.
3. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
4. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment.

2.2 ACCESSORIES

A. Volume Dampers and Control Dampers: Single-blade and multiple opposed-blade dampers, standard leakage rating, and suitable for horizontal or vertical applications; factory fabricated and complete with required hardware and accessories.

B. Fire Dampers: Rated and labeled according to UL 555 by an NRTL; factory fabricated and complete with required hardware and accessories.

C. Ceiling Fire Dampers: Labeled according to UL 555C by an NRTL and complying with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory." Provide factory-fabricated units complete with required hardware and accessories.

D. Smoke Dampers: Labeled according to UL 555S by an NRTL. Combination fire and smoke dampers shall also be rated and labeled according to UL 555. Provide factory-fabricated units complete with required hardware and accessories.

E. Flexible Connectors: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

F. Flexible Ducts: Spiral-wound steel spring with flameproof vinyl sheathing complying with UL 181, Class 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Outdoor, Supply-Air Ducts: Seal Class A.
2. Outdoor, Exhaust Ducts: Seal Class C.
3. Outdoor, Return-Air Ducts: Seal Class C.
4. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class B.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class A.
6. Unconditioned Space, Exhaust Ducts: Seal Class C.
7. Unconditioned Space, Return-Air Ducts: Seal Class B.
8. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class C.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
10. Conditioned Space, Exhaust Ducts: Seal Class B.
11. Conditioned Space, Return-Air Ducts: Seal Class C.

C. Conceal ducts from view in finished and occupied spaces.

D. Avoid passing through electrical equipment spaces and enclosures.

E. Support ducts to comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Hangers and Supports."

F. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

G. Install volume and control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.

H. Install fire dampers according to UL listing.

I. Install fusible links in fire dampers.

J. Clean new duct system(s) before testing, adjusting, and balancing.

3.2 TESTING, ADJUSTING, AND BALANCING

A. Balance airflow within distribution systems, including submains, branches, and terminals to indicated quantities.

END OF SECTION 15810

SECTION 15838 - POWER VENTILATORS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Products shall be licensed to use the AMCA-Certified Ratings Seal.

C. Power ventilators shall comply with UL 705.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL VENTILATORS

A. Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:

1. Loren Cook

2. Greenheck

3. S&P.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
2. Wall-Mounting Units: Aluminum rectangular base with venturi inlet cone, motor mount, and vibration isolators designed for wall mounting.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt-Driven Drive Assembly: Resiliently mounted to housing.

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
2. Bird Screens: Removable, 1/2-inch (13-mm) mesh, aluminum or brass wire.
3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
4. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in raised cant and mounting flange.
2. Overall Height: 12 inches (300 mm).
3. Pitch Mounting: Manufacture curb for roof slope.
4. Mounting Pedestal: Galvanized steel with removable access panel.

2.2 CEILING-MOUNTING OR IN-LINE CENTRIFUGAL VENTILATORS

A. Basis-of-Design Product: Product indicated on Drawings or comparable product by one of the following:

1. Loren Cook

2. Greenheck

3. S&P.

4. Broan

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Plastic or Aluminum, louvered or egg-crate grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Motion Sensor: Motion detector with adjustable shutoff timer.
4. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
5. Filter: Washable aluminum to fit between fan and grille.
6. Isolation: Rubber-in-shear vibration isolators.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Roof-Mounted Units: Install and secure roof-mounted fans on curbs, and coordinate roof penetrations and flashing with roof construction.

B. In-Line Centrifugal Fans: Suspend units from structural-steel support frame using threaded steel rods and vibration isolation springs.

C. Ceiling-Mounted Units: Suspend units from structure using steel wire or metal straps.

D. Ground power ventilators.

END OF SECTION 15838

SECTION 15840 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 SHUTOFF SINGLE-DUCT AIR TERMINAL UNITS

A. Products:

1. Carrier

2. Trane

3. Honeywell

4. Titus

5. Envirotec

B. Configuration: Volume-damper assembly inside unit casing with control components located inside a protective metal shroud.

C. Casing: 0.034-inch (0.85-mm) steel, single wall.

1. Casing Lining: Adhesive attached, 3/4-inch- (19-mm-) thick, coated, fibrous-glass duct liner complying with ASTM C 1071.
2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections, size matching inlet size.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.

D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

E. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins, and rated for a minimum working pressure of 200 psig (1380 kPa). Include manual air vent and drain valve.

F. Electric Heating Coil: Slip-in-type, open-coil design with integral control box factory wired and installed. Include primary and secondary overtemperature protection, nickel-chrome 80/20 heating elements, fan interlock contacts, disconnect switch, fuses (for coils more than 48 A), and magnetic contactor for each step of control (for three-phase coils).

G. Electronic Controls: Bidirectional damper operator and microprocessor-based controller with integral airflow transducer and room sensor. Control devices shall be compatible with temperature controls.

H. Control Sequence:

1. Suitable for operation with duct pressures between 0.25- and 3.0-inch wg (60- and 750-Pa) inlet static pressure.
2. System-powered, wall-mounted thermostat.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Install piping adjacent to air terminal units to allow service and maintenance.

D. Connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

E. Connect ducts to air terminal units.

END OF SECTION 15840

SECTION 15855 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and color charts for factory finishes.

PART 2 - PRODUCTS

2.1 OUTLETS AND INLETS

A. Diffusers:

1. Products:

a. Titus

b. Hart & Cooley

c. Price

2. Material: Aluminum.
3. Finish: Baked enamel, white.

B. Wall and Ceiling Registers:

1. Products:

a. Titus

b. Hart & Cooley

c. Price

2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Mounting: Countersunk screw and Lay-In.

C. Wall and Ceiling Grilles:

1. Material: Aluminum.
2. Finish: Baked enamel, white.
3. Mounting: Countersunk screw and Lay-In.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel unless otherwise indicated. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 15855

SECTION 15900 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

1.2 Submittals:

A. Product Submittal Requirements: Meet requirements of Section 01600 on Shop Drawings, Product Data, and Samples. Provide six copies of shop drawings and other submittals on hardware, software, and equipment to be installed or furnished. Begin no work until submittals have been approved for conformity with design intent. Provide drawings as AutoCAD 2006 (or newer) compatible files on magnetic or optical disk (file format: .DWG, .DXF, .VSD, or comparable) and 3 prints of each drawing on 11" x 17" paper. When manufacturer's cutsheets apply to a product series rather than a specific product, clearly indicate applicable data by highlighting or by other means. Clearly reference covered specification and drawing on each submittal. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work. Submittal approval does not relieve Contractor of responsibility to supply sufficient quantities to complete work. Provide submittals within 12 weeks of contract award on the following:

1. Direct Digital Controls Hardware
    a. Complete bill of materials indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.
    b. Manufacturer's description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:
        1) Direct digital controllers (controller panels)
        2) Transducers and transmitters
        3) Sensor (include accuracy data)
        4) Actuators
        5) Valves
        6) Relays and switches
        7) Cotnrol Panels
        8) Power Supplies
        9) Batteries
        10) Operator interface equipment
        11) Wiring
    c. Wiring diagrams and layouts for each control panel. Show termination numbers.
    d. Floor plan schematic diagrams indicating field sensor and controller locations.
    e. Riser diagrams showing control network layout, communication protocol, and wire types.
2. Central System Hardware and Software

a. Complete bill of material indicating quantity, manufacturer, model number, and relevant technical data of equipment used.

b. Manufacturer's description and technical data such as product specifications and installation and maintenance instructions for items listed below and for relevant items furnished under this contract not listed below:

1) Central Processing Unit (CPU) or web server
2) Monitors
3) Keyboards
4) Power supplies
5) Battery backups
6) Interface equipment between CPU or server and control panels
7) Operating System software
8) Operator interface software
9) Color graphic software
10) Third-party software

c. Schematic diagrams of control, communication, and power wiring for central system installation. Show interface wiring to control system. Network riser diagrams of wiring between central control unit and control panels.

3. Controlled Systems

a. Riser diagrams showing control network layout, communication protocol, and wire types.

b. Schematic diagram of each controlled system. Label control points with point names. Graphically show locations of control elements.

c. Schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.

d. Instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.

e. Complete description of control system operation including sequences of operation. Include and reference schematic diagram of controlled system. List I/O points and software points specified in Section 15900 Appendix A. Indicate alarmed and trended points.

4. Description of process, report formats, and checklists to be used in Section 15900 Article 3.16 (Control System Demonstration and Acceptance).

5. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.

B. Schedules

1. Schedule of work provided within one month of contract award, indicating:

a. Intended sequence of work items

b. Start date of each work item

c. Duration of each work item

d. Planned delivery dates for ordered material and equipment and expected lead times

e. Milestones indicating possible restraints on work by other trades or situations

2. Monthly written status reports indicating work completed and revisions to expected delivery dates. Include updated schedule of work.

C. Project Record Documents. Submit three copies of record (as-built) documents upon completion of installation for approval prior to final completion. Submittal shall consist of:

a. Project Record Drawings. As-built versions of submittal shop drawings provided as AutoCAD 2006 (or newer) compatible files on magnetic or optical disk (file format: .DWG, .DXF, .VSD, or comparable) and 6 prints of each drawing on 11" x 17" paper.

b. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Section 15900 Article 3.16 (Control System Demonstration and Acceptance).

c. Operation and Maintenance (O&M) Manual. Printed, electronic, or online help documentation of the following:

1) As-built versions of submittal product data.

2) Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.

3) Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.

4) Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.

5) Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.

6) Documentation of programs created using custom programming language including setpoints, tuning parameters, and object database. Electronic copies of programs shall meet this requirement if control logic, setpoints, tuning parameters, and objects can be viewed using furnished programming tools.

7) Graphic files, programs, and database on magnetic or optical media.

8) List of recommended spare parts with part numbers and suppliers.

9) Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.

10) Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation or web server software, and graphics software.

11) Licenses, guarantees, and warranty documents for equipment and systems.

12) Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.

d. Training Materials: Provide course outline and materials for each class at least six weeks before first class. Training shall be furnished via instructor-led sessions,

computer-based training, or web-based training. Engineer will modify course outlines and materials if necessary to meet Owner's needs. Engineer will review and approve course outlines and materials at least three weeks before first class.

1.3 WARRANTY

A. Warrant work as follows:
   1. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.
   2. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
   3. If Engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, Engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.
   4. Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.
   5. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.

1.4 OWNERSHIP OF PROPRIETARY MATERIAL

A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:
   1. Graphics
   2. Record drawings
   3. Database
   4. Application programming code
      Documentation

PART 2 - PRODUCTS

2.0 SECTION INCLUDES:
   2.1 Materials
   2.2 Communication

2.1 Materials

A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.

2.2 Communication

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.

B. Install new wiring and network devices as required to provide a complete and workable control network.

C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.

1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.

2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified in Section 15900 Appendix A. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

E. Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated controller via the internetwork. If applicable, system shall automatically adjust for daylight saving and standard time.

F. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

2.3 Operator Interface

A. Operator Interface. Web server shall reside on high-speed network with building controllers. Each standard browser connected to server shall be able to access all system information.

B. Communication. Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135, BACnet Annex J.

C. Hardware. Each workstation or web server shall consist of the following:

1. Hardware Base. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications and shall meet response times specified in Section 15900 Paragraph 1.9. Hard disk shall have sufficient memory to store system software, one year of data for trended points specified in Appendix A, and a system database at least twice the size of the existing database at system acceptance. Configure computers and network connections if multiple computers are required to meet specified memory and performance. Web server or workstations shall be IBM-compatible PCs with a minimum of:

    a. Intel Core 2 Duo 3 GHz processor

    b. 2 GB RAM

    c. 250 GB hard disk providing data at 100 MB/sec

    d. 16x CD-RW/DVD drive

    e. Serial, parallel, and network communication ports and cables required for proper system operation

D. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:

1. Log In and Log Out. System shall require user name and password to log in to operator interface.

2. Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.

3. View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, PID gains, on and off controls, and sensor calibration.

4. View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.

5. View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.

6. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.

7. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.

8. Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.

9. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

E. System Software.

1. Operating System. Web server shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Windows 7, Windows XP Pro,

2. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract.

   a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.

   b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.

   c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.

   d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Adobe Flash).

F. System Tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If fur-

nished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.

2. Controller Memory Download. Operators shall be able to download memory from the system database to each controller.

3. System Configuration. Operators shall be able to configure the system.

4. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.

5. Security. System shall require a user name and password to view, edit, add, or delete data.

    a. Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object.

    b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.

    c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

6. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).

7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Section 15900 Appendix A (Sequences of Operation). Alarms shall be BACnet alarm objects and shall use BACnet alarm services.

8. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.

9. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.

10. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.

11. Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Configure trends as specified in Section 15900 Appendix A (Sequences of Operation). Trends shall be BACnet trend objects.

12. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.

13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.

14. Standard Reports. Furnish the following standard system reports:

    a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.

    b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.

    c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:

        i. Alarm History.

        ii. Trend Data. Operator shall be able to select trends to be logged.

        iii. Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.

15. Energy Reports. System shall include an easily configured energy reporting tool that provides the capabilities described in this section.

    a. The energy reporting tool shall be accessible through the same user interface (Web browser or operator workstation software) as is used to manage the BAS.

    b. The energy reporting tool shall be preconfigured by the Contractor to gather and store energy demand and consumption data from each energy source that provides metered data to the BAS. Meter data shall be stored at 5 minute intervals unless otherwise specified in the Sequence of Operation provided in Appendix A. This data shall be maintained in an industry standard SQL database for a period of not less than five years.

    c. The energy reporting tool shall allow the operator to select an energy source and a time period of interest (day, week, month, year, or date range) and shall provide

options to view the data in a table, line graph, bar graph, or pie chart. The tool shall also allow the operator to select two or more data sources and display a comparison of the energy used over this period in any of the listed graph formats, or to total the energy used by the selected sources and display that data in the supported formats.

d. The energy reporting tool shall allow the operator to select an energy source and two time periods of interest (day, week, month, year, or date range) and display a graph that compares the energy use over the two time periods in any of the graph formats listed in the previous paragraph. The tool shall also allow the operator to select multiple energy sources and display a graph that compares the total energy used by these sources over the two time periods.

e. The energy reporting tool shall allow the operator to easily generate the previously described graphs "on the fly," and shall provide an option to store the report format so the operator can select that format to regenerate the graph at a future date. The tool shall also allow the user to schedule these reports to run on a recurring basis using relative time periods, such as automatically generating a consumption report on the first Monday of each month showing consumption over the previous month. Automatically generated reports shall be archived on the server in a common industry format such as Adobe PDF or Microsoft Excel with copies e-mailed to a user editable list of recipients.

f. The energy reporting tool shall be capable of collecting and displaying data from the following types of meters:

    i. Electricity

    ii. Gas

    iii. Oil

    iv. Steam

    v. Chilled Water

    vi. Potable Water

    vii. Heating and cooling degree days. (May be calculated from sensor data rather than metered.)

g. The user shall have the option of using Kw (Kwh) or Btu/hr (Btu) as the units for demand and consumption reports. Multiples of these units (MWH, kBtu, etc.) shall be used as appropriate. All selected sources shall be automatically converted to the selected units. The user shall similarly have the option of entering facility area and occupancy hours and creating reports that are normalized on an area basis, an annual use basis, or an occupied hour basis.

h. The user shall have the option of entering benchmark data for an individual facility or a group of facilities.

i. The user shall have the option of displaying any or all of the following data on any chart, line, or bar graph generated by the energy reporting tool:

    i. Low/High/Average value of the metered value being displayed.

    ii. Heating and/or Cooling Degree Days for the time period(s) being displayed.

16. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.

17. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.

18. Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:

    a. Language. Language shall be graphically based or English language oriented. If graphically based, language shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks. If English language oriented, language shall be based on the syntax of BASIC, FORTRAN, C, or PASCAL, and shall allow for free-form programming that is not column-oriented or "fill-in-the-blanks."

    b. Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.

    c. Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.

    d. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.

e. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

f. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.

g. Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.

i. Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.

ii. System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

G. Portable Operator's Terminal. Provide all necessary software to configure an IBM-compatible laptop computer for use as a Portable Operator's Terminal. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.

H. Operator Workstation: Web server or workstation shall conform to BACnet Operator Workstation (B-OWS) device profile or BACnet Advanced Workstation (B-AWS) as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-OWS or B-AWS in the BACnet Testing Laboratories (BTL) Product Listing.

2.4 Controller Software

A. Building and energy management application software shall reside and operate in system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.

B. System Security. See Paragraph 2.3.F.5 (Security) and Paragraph 2.3.F.15.c (Operator Activity).

C. Scheduling. See Paragraph 2.3.D.4 (View and Adjust Operating Schedules). System shall provide the following schedule options as a minimum:

1. Weekly. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).

2. Exception. Operator shall be able to designate an exception schedule for each of the next 365 days. After an exception schedule has executed, system shall discard and replace exception schedule with standard schedule for that day of the week.

3. Holiday. Operator shall be able to define 24 special or holiday schedules of varying length on a scheduling calendar that repeats each year.

D. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.

E. Binary and Analog Alarms. See Paragraph 2.3.F.7 (Alarm Processing).

F. Alarm Reporting. See Paragraph 2.3.F.9 (Alarm Reactions).

G. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms. If no network connection is available, system shall use a modem connection.

H. Demand Limiting.

1. System shall monitor building power consumption from building power meter pulse generator signals or from building feeder line watt transducer or current transformer.

2. When power consumption exceeds adjustable levels, system shall automatically adjust setpoints, de-energize low-priority equipment, and take other programmatic actions to reduce demand as specified in Section 15900 Appendix A (Sequences of Operation). When demand drops below adjustable levels, system shall restore loads as specified.

I. Maintenance Management. System shall generate maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits. Configure and enable maintenance alarms as specified in Section 15900 Appendix A (Sequences of Operation).

J. Sequencing. Application software shall sequence chillers, boilers, and pumps as specified in Section 15900 Appendix A (Sequences of Operation).

K. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs.

L. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.

M. Energy Calculations.

1. System shall accumulate and convert instantaneous power (kW) or flow rates (L/s [gpm]) to energy usage data.

2. System shall calculate a sliding-window average (rolling average). Operator shall be able to adjust window interval to 15 minutes, 30 minutes, or 60 minutes.

N. Anti-Short Cycling. Binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.

O. On and Off Control with Differential. System shall provide direct- and reverse-acting on and off algorithms with adjustable differential to cycle a binary output based on a controlled variable and setpoint.

P. Runtime Totalization. System shall provide an algorithm that can totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified in Section 15900 Appendix A (Sequence of Operations).

2.5 Controllers

A. General. Provide Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in Section 15900 Article 1.9 (System Performance). Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

B. BACnet.

1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.

2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.

4. Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.

5. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

6. BACnet Communication.

    a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.

    b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.

c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.

f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

C. Communication.

1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.

2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.

3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.

4. Stand-Alone Operation. Each piece of equipment specified in Section 15900 Appendix A shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.

1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).

2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

E. Keypad. Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and display for each BC and AAC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.

F. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.

G. Serviceability.

1. Controllers shall have diagnostic LEDs for power, communication, and processor.

2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.

3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

H. Memory.

1. Controller memory shall support operating system, database, and programming requirements.

2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.

3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

I. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

J. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.6 Input and Output Interface

A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.

B. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.

C. Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.

E. Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.

G. Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.

H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

I. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.7 Power Supplies And Line Filtering

A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.

b. Line voltage units shall be UL recognized and CSA listed.

B. Power Line Filtering.

1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

b. Dielectric strength of 1000 V minimum

c. Response time of 10 nanoseconds or less

d. Transverse mode noise attenuation of 65 dB or greater

e. Common mode noise attenuation of 150 dB or greater at 40-100 Hz

2.8 Auxiliary Control Devices

A. Motorized Control Dampers.

1. Type. Control dampers shall have linear flow characteristics and shall be parallel- or opposed-blade type as specified below or as scheduled on drawings.

a. Outdoor and return air mixing dampers and face-and-bypass dampers shall be parallel-blade and shall direct airstreams toward each other.

b. Other modulating dampers shall be opposed-blade.

c. Two-position shutoff dampers shall be parallel- or opposed-blade with blade and side seals.

2. Frame. Damper frames shall be 2.38 mm (13 gauge) galvanized steel channel or 3.175 mm (1/8 in.) extruded aluminum with reinforced corner bracing.

3. Blades. Damper blades shall not exceed 20 cm (8 in.) in width or 125 cm (48 in.) in length. Blades shall be suitable for medium velocity (10 m/s [2000 fpm]) performance. Blades shall be not less than 1.5875 mm (16 gauge).

4. Shaft Bearings. Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze, or better.

5. Seals. Blade edges and frame top and bottom shall have replaceable seals of butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade seals shall leak no more than 50 L/s·m ^{2} (10 cfm per ft^2) at 1000 Pa (4 in. w.g.) differential pressure. Blades shall be airfoil type suitable for wide-open face velocity of 7.5 m/s (1500 fpm).

6. Sections. Damper sections shall not exceed 125 cm - 150 cm (48 in. - 60 in.). Each section shall have at least one damper actuator.

7. Linkages. Dampers shall have exposed linkages.

B. Electric Damper and Valve Actuators.

1. Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.

2. Spring-return Mechanism. Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).

3. Signal and Range. Proportional actuators shall accept a 0-10 Vdc or a 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 2.6H.)

4. Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.

5. Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.

C. Control Valves.

1. General. Select body and trim materials in accordance with manufacturer's recommendations for design conditions and service shown.

2. Type. Provide two- or three-way control valves for two-position or modulating service as shown.

3. Water Valves.

    a. Valves providing two-position service shall be quick opening. Two-way valves shall have replaceable disc or ball.

    b. Close-off (Differential) Pressure Rating. Valve actuator and trim shall provide the following minimum close-off pressure ratings.

        i. Two-way: 150% of total system (pump) head.

        ii. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.

    c. Ports. Valves providing modulating service shall have equal percentage ports.

    d. Sizing.

        i. Two-position service: line size.

        ii. Two-way modulating service: select pressure drop equal to the greatest of twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 35 kPa (5 psi).

        iii. Three-way modulating service: select pressure drop equal to the smaller of twice the pressure drop through the coil exchanger (load) or 35 kPa (5 psi).

    e. Fail Position. Water valves shall fail normally open or closed as follows unless otherwise specified.

        i. Water zone valves: normally open.

        ii. Heating coils in air handlers: normally open.

        iii. Chilled water control valves: normally closed.

        iv. Other applications: as scheduled or as required by sequences of operation.

4. Steam Valves.

    a. Close-off (Differential) Pressure Rating. Valve actuator and trim shall provide minimum close-off pressure rating equal to 150% of operating (inlet) pressure.

    b. Ports. Valves providing modulating service shall have linear ports.

c. Sizing.

i. Two-position service: select pressure drop equal to 10%-20% of inlet psig.

ii. Modulating service at 100 kPa (15 psig) or less: select pressure drop equal to 80% of inlet psig.

iii. Modulating service at 101-350 kPa (16-50 psig): select pressure drop equal to 50% of inlet psig.

iv. Modulating service at over 350 kPa (50 psig): select pressure drop as scheduled on drawings.

D. Binary Temperature Devices.

1. Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

2. Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

3. Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

E. Temperature Sensors.

1. Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.

2. Duct Sensors. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m^2(10 ft^2) of duct cross-section.

3. Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.

4. Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port as shown.

5. Differential Sensors. Provide matched sensors for differential temperature measurement.

F. Humidity Sensors.

1. Duct and room sensors shall have a sensing range of 20%-80%.

2. Duct sensors shall have a sampling chamber.

3. Outdoor air humidity sensors shall have a sensing range of 20%-95% RH and shall be suitable for ambient conditions of 40°C-75°C (40°F-170°F).

4. Humidity sensors shall not drift more than 1% of full scale annually.

G. Flow Switches. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service) as shown. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

1. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.

2. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

H. Relays.

1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

I. Override Timers.

1. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

J. Current Transmitters.

1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.

2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.

3. Unit shall be split-core type for clamp-on installation on existing wiring.

K. Current Transformers.

1. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.

2. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.

3. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

L. Voltage Transmitters.

1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.

2. Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.

3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

M. Voltage Transformers.

1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.

2. Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.

3. Windings (except for terminals) shall be completely enclosed with metal or plastic.

N. Power Monitors.

1. Power monitors shall be three-phase type and shall have three-phase disconnect and shorting switch assembly, UL listed voltage transformers, and UL listed split-core current transformers.

2. Power monitors shall provide selectable output: rate pulse for kWh reading or 4-20 mA for kW reading. Power monitors shall operate with 5 A current inputs and maximum error of ±2% at 1.0 power factor or ±2.5% at 0.5 power factor.

O. Current Switches.

1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

P. Pressure Transducers.

1. Transducers shall have linear output signal and field-adjustable zero and span.

2. Continuous operating conditions of positive or negative pressure 50% greater than calibrated span shall not damage transducer sensing elements.

3. Water pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer shall have 4-20 mA output, suitable mounting provisions, and block and bleed valves.

4. Water differential pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure shall be 2000 kPa (300 psi.) Transducer shall have 4-20 mA output, suitable mounting provisions, and 5-valve manifold.

Q. Differential Pressure Switches. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

R. Pressure-Electric (PE) Switches. PE switches shall be UL listed, pilot duty rated (125 VA minimum) or motor control rated, metal or neoprene diaphragm actuated, operating pressure rated for 0-175 kPa (0-25 psig), with calibrated scale minimum setpoint range of 14-125 kPa (2-18 psig).

1. Provide one- or two-stage switch action (SPDT, DPST, or DPDT) as required by application.

2. Switches shall be open type (panel-mounted). Exception: Switches shall be enclosed type for remote installation. Enclosed type shall be NEMA 1 unless otherwise specified.

3. Each pneumatic signal line to PE switches shall have permanent indicating gauge.

S. Local Control Panels.

1. Indoor control panels shall be fully enclosed NEMA 1 construction with hinged door keylock latch and removable sub-panels. A common key shall open each control panel and sub-panel.

2. Prewire internal and face-mounted device connections with color-coded stranded conductors tie-wrapped or neatly installed in plastic troughs. Field connection terminals shall be UL listed for 600 V service, individually identified per control and interlock drawings, with adequate clearance for field wiring.

3. Each local panel shall have a control power source power switch (on-off) with overcurrent protection.

2.9 Wiring And Raceways

A. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 16.

B. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.

PART 3 - EXECUTION

PART 3: EXECUTION

3.0 Section Includes

3.1 Examination

A. Thoroughly examine project plans for control device and equipment locations. Report discrepancies, conflicts, or omissions to Architect or Engineer for resolution before starting rough-in work.

B. Inspect site to verify that equipment can be installed as shown. Report discrepancies, conflicts, or omissions to Engineer for resolution before starting rough-in work.

C. Examine drawings and specifications for work of others. Report inadequate headroom or space conditions or other discrepancies to Engineer and obtain written instructions for changes necessary to accommodate Section 15900 work with work of others. Controls Contractor shall perform at his expense necessary changes in specified work caused by failure or neglect to report discrepancies.

3.2 Protection

A. Controls Contractor shall protect against and be liable for damage to work and to material caused by Contractor's work or employees.

B. Controls Contractor shall be responsible for work and equipment until inspected, tested, and accepted. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 Coordination

A. Site.

1. Assist in coordinating space conditions to accommodate the work of each trade where work will be installed near or will interfere with work of other trades. If installation without coordination causes interference with work of other trades, Contractor shall correct conditions without extra charge.

2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Submittals. See Section 15900 Article 1.10 (Submittals).

C. Test and Balance.

1. Provide Test and Balance Contractor a single set of necessary tools to interface to control system for testing and balancing.

2. Train Test and Balance Contractor to use control system interface tools.

3. Provide a qualified technician to assist with testing and balancing the first 20 terminal units.

4. Test and Balance Contractor shall return tools undamaged and in working condition at completion of testing and balancing.

D. Life Safety.

1. Duct smoke detectors required for air handler shutdown are provided under Division 16. Interlock smoke detectors to air handlers for shutdown as specified in Section 15900 Appendix A (Sequences of Operation).

2. Smoke dampers and actuators required for duct smoke isolation are provided under Division 15. Interlock smoke dampers to air handlers as specified in Section 15900 Appendix A (Sequences of Operation).

3. Fire and smoke dampers and actuators required for fire-rated walls are provided under Division 15. Fire and smoke damper control is provided under Division 16.

E. Coordination with Other Controls. Integrate with and coordinate controls and control devices furnished or installed by others as follows.

1. Communication media and equipment shall be provided as specified in Section 15900 Article 2.2 (Communication).

2. Each supplier of a controls product shall configure, program, start up, and test that product to meet the sequences of operation described in Section 15900 Appendix A regardless of where within the contract documents those products are described.

3. Coordinate and resolve incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.

4. Controls Contractor shall be responsible for integration of control products provided by multiple suppliers regardless of where integration is described within the contract documents.

3.4 General Workmanship

A. Install equipment, piping, and wiring or raceway horizontally, vertically, and parallel to walls wherever possible.

B. Provide sufficient slack and flexible connections to allow for piping and equipment vibration isolation.

C. Install equipment in readily accessible locations as defined by National Electrical Code (NEC) Chapter 1 Article 100 Part A.

D. Verify wiring integrity to ensure continuity and freedom from shorts and ground faults.

E. Equipment, installation, and wiring shall comply with industry specifications and standards and local codes for performance, reliability, and compatibility.

3.5 Field Quality Control

A. Work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances as identified in Section 15900 Article 1.8 (Codes and Standards).

B. Continually monitor field installation for code compliance and workmanship quality.

C. Contractor shall arrange for work inspection by local or state authorities having jurisdiction over the work.

3.6 Wiring

A. Control and interlock wiring and installation shall comply with national and local electrical codes, Division 16, and manufacturer's recommendations. Where the requirements of Section 15900 differ from Division 16, Section 15900 shall take precedence.

B. NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by NEC and Division 16.

C. Low-voltage wiring shall meet NEC Class 2 requirements. Subfuse low-voltage power circuits as required to meet Class 2 current limit.

D. NEC Class 2 (current-limited) wires not in raceway but in concealed and accessible locations such as return air plenums shall be UL listed for the intended application.

E. Install wiring in raceway where subject to mechanical damage and at levels below 3 m (10ft) in mechanical, electrical, or service rooms.

F. Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.

G. Do not install wiring in raceway containing tubing.

H. Run exposed Class 2 wiring parallel to a surface or perpendicular to it and tie neatly at 3 m (10 ft) intervals.

I. Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.

J. Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceways, piping, or ceiling suspension systems.

K. Size raceway and select wire size and type in accordance with manufacturer's recommendations and NEC requirements.

L. Include one pull string in each raceway 2.5 cm (1 in.) or larger.

M. Use color-coded conductors throughout.

N. Locate control and status relays in designated enclosures only. Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.

O. Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of 15 cm (6 in.) between raceway and high-temperature equipment such as steam pipes or flues.

P. Adhere to requirements in Division 16 where raceway crosses building expansion joints.

Q. Install insulated bushings on raceway ends and enclosure openings. Seal top ends of vertical raceways.

R. Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.

S. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size. Use liquid-tight flexible metal raceways in areas exposed to moisture including chiller and boiler rooms.

T. Install raceway rigidly, support adequately, ream at both ends, and leave clean and free of obstructions. Join raceway sections with couplings and according to code. Make terminations in boxes with fittings. Make terminations not in boxes with bushings.

3.7 Communication Wiring

A. Communication wiring shall be low-voltage Class 2 wiring and shall comply with Article 3.7 (Wiring).

B. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

C. During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.

D. Verify entire network's integrity following cable installation using appropriate tests for each cable.

E. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.

F. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.

G. Label communication wiring to indicate origination and destination.

H. Ground coaxial cable according to NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

I. BACnet MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:

    1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)

    2. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485.

    3. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.

    4. An MS/TP EIA-485 network shall have no T connections.

3.8 Fiber Optic Cable

A. During installation do not exceed maximum pulling tensions specified by cable manufacturer. Post-installation residual cable tension shall be within cable manufacturer's specifications.

B. Install cabling and associated components according to manufacturers' instructions. Do not exceed minimum cable and unjacketed fiber bend radii specified by cable manufacturer.

3.9 Installation of Sensors

A. Install sensors according to manufacturer's recommendations.

B. Mount sensors rigidly and adequately for operating environment.

C. Install room temperature sensors on concealed junction boxes properly supported by wall framing.

D. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas.

E. Use averaging sensors in mixing plenums and hot and cold decks. Install averaging sensors in a serpentine manner vertically across duct. Support each bend with a capillary clip.

F. Install mixing plenum low-limit sensors in a serpentine manner horizontally across duct. Support each bend with a capillary clip. Provide 3 m (1 ft) of sensing element for each 1 m^2 (1 ft^2) of coil area.

G. Install pipe-mounted temperature sensors in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.

H. Install outdoor air temperature sensors on north wall at designated location with sun shield.

I. Differential Air Static Pressure.

1. Supply Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Make pressure tap connections according to manufacturer's recommendations.

2. Return Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Make pressure tap connections according to manufacturer's recommendations.

3. Building Static Pressure. Pipe pressure sensor's low-pressure port to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe high-pressure port to a location behind a thermostat cover.

4. Piping to pressure transducer pressure ports shall contain a capped test port adjacent to transducer.

5. Pressure transducers, except those controlling VAV boxes, shall be located in control panels, not on monitored equipment or on ductwork. Mount transducers in a vibration-free location accessible for service without use of ladders or special equipment.

6. Mount gauge tees adjacent to air and water differential pressure taps. Install shut-off valves before tee for water gauges.

J. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.

3.10 Flow Switch Installation

A. Use correct paddle for pipe diameter.

B. Adjust flow switch according to manufacturer's instructions.

3.11 Actuators

A. General. Mount actuators and adapters according to manufacturer's recommendations.

B. Electric and Electronic Damper Actuators. Mount actuators directly on damper shaft or jackshaft unless shown as a linkage installation. Link actuators according to manufacturer's recommendations.

1. For low-leakage dampers with seals, mount actuator with a minimum 5° travel available for damper seal tightening.

2. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, then tighten linkage.

3. Check operation of damper-actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

4. Provide necessary mounting hardware and linkages for actuator installation.

C. Valve Actuators. Connect actuators to valves with adapters approved by actuator manufacturer.

3.12 Warning Labels

A. Affix permanent warning labels to equipment that can be automatically started by the control system.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

C A U T I O N **This equipment is operating under automatic control and may start or stop at** **any time without warning. Switch disconnect to "Off" position before servicing.**

B. Affix permanent warning labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

C A U T I O N This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.13 Identification of Hardware and Wiring

A. Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 5 cm (2 in.) of termination.

B. Label pneumatic tubing at each end within 5 cm (2 in.) of termination with a descriptive identifier.

C. Permanently label or code each point of field terminal strips to show instrument or item served.

D. Label control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.

E. Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement.

F. Label room sensors related to terminal boxes or valves with nameplates.

G. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

H. Label identifiers shall match record documents.

3.14 Programming

A. Point Naming. Name points as shown on the equipment points list provided with each sequence of operation. See Section 15900 Appendix A (Sequences of Operation). If character limitations or space restrictions make it advisable to shorten the name, the abbreviations given in Appendix C may be used. Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.

B. Software Programming. Programming shall provide actions for each possible situation. Graphic- or parameter-based programs shall be documented. Text-based programs shall be modular, structured, and commented to clearly describe each section of the program.

   1. Application Programming. Provide application programming that adheres to sequences of operation specified in Section 15900 Appendix A. Program documentation or comment statements shall reflect language used in sequences of operation.

   2. System Programming. Provide system programming necessary for system operation.

C. Operator Interface.

   1. Standard Graphics. Provide graphics as specified in Section 15900 Article 2.3 Paragraph E.2 (System Graphics). Show on each equipment graphic input and output points and rele-

vant calculated points such as indicated on the applicable Points List in Section 15900 Appendix A. Point information on graphics shall dynamically update.

2. Install, initialize, start up, and troubleshoot operator interface software and functions (including operating system software, operator interface database, and third-party software installation and integration required for successful operator interface operation) as described in Section 15900.

3.15 Control System Checkout and Testing

A. Startup Testing. Complete startup testing to verify operational control system before notifying Owner of system demonstration. Provide Owner with schedule for startup testing. Owner may have representative present during any or all startup testing.

1. Calibrate and prepare for service each instrument, control, and accessory equipment furnished under Section 15900.

2. Verify that control wiring is properly connected and free of shorts and ground faults. Verify that terminations are tight.

3. Enable control systems and verify each input device's calibration. Calibrate each device according to manufacturer's recommendations.

4. Verify that binary output devices such as relays, solenoid valves, two-position actuators and control valves, and magnetic starters, operate properly and that normal positions are correct.

5. Verify that analog output devices such as I/Ps and actuators are functional, that start and span are correct, and that direction and normal positions are correct. Check control valves and automatic dampers to ensure proper action and closure. Make necessary adjustments to valve stem and damper blade travel.

6. Prepare a log documenting startup testing of each input and output device, with technician's initials certifying each device has been tested and calibrated.

7. Verify that system operates according to sequences of operation. Simulate and observe each operational mode by overriding and varying inputs and schedules. Tune PID loops and each control routine that requires tuning.

8. Alarms and Interlocks.

    a. Check each alarm with an appropriate signal at a value that will trip the alarm.

    b. Trip interlocks using field contacts to check logic and to ensure that actuators fail in the proper direction.

    c. Test interlock actions by simulating alarm conditions to check initiating value of variable and interlock action.

3.16 Control System Demonstration and Acceptance

A. Demonstration. Prior to acceptance, perform the following performance tests to demonstrate system operation and compliance with specification after and in addition to tests specified in Article 3.17 (Control System Checkout and Testing). Provide Engineer with log documenting completion of startup tests.

1. Engineer will be present to observe and review system demonstration. Notify Engineer at least 10 days before system demonstration begins.

2. Demonstration shall follow process submitted and approved under Section 15900 Article 1.10 (Submittals). Complete approved checklists and forms for each system as part of system demonstration.

3. Demonstrate actual field operation of each sequence of operation as specified in Section 15900 Appendix A. Provide at least two persons equipped with two-way communication. Demonstrate calibration and response of any input and output points requested by Engineer. Provide and operate test equipment required to prove proper system operation.

4. Demonstrate compliance with Section 15900 Part 1 (System Performance).

5. Demonstrate compliance with sequences of operation through each operational mode.

6. Demonstrate complete operation of operator interface.

7. Demonstrate each of the following.

    a. DDC loop response. Supply graphical trend data output showing each DDC loop's response to a setpoint change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show setpoint, actuator position, and controlled variable values. Engineer will require further tuning of each loop that displays unreasonably under- or over-damped control.

    b. Demand limiting. Supply trend data output showing demand-limiting algorithm action. Trend data shall document action sampled each minute over at least a 30-minute period and shall show building kW, demand-limiting setpoint, and status of setpoints and other affected equipment parameters.

    c. Building fire alarm system interface.

    d. Trend logs for each system. Trend data shall indicate setpoints, operating points, valve positions, and other data as specified in the points list provided with each sequence of operation in Section 15900 Appendix A. Each log shall cover three 48-hour periods and shall have a sample frequency not less than 10 minutes or as specified on its points list. Logs shall be accessible through system's operator interface and shall be retrievable for use in other software programs as specified in Section 15900 Article 2.3 Paragraph E.11 (Trend Configuration).

8. Tests that fail to demonstrate proper system operation shall be repeated after Contractor makes necessary repairs or revisions to hardware or software to successfully complete each test.

B. Acceptance.

1. After tests described in this specification are performed to the satisfaction of both Engineer and Owner, Engineer will accept control system as meeting completion requirements. Engineer may exempt tests from completion requirements that cannot be performed due to circumstances beyond Contractor's control. Engineer will provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.

2. System shall not be accepted until completed demonstration forms and checklists are submitted and approved as required in Section 15900 Article 1.10 (Submittals).

3.17 Cleaning

A. Each day clean up debris resulting from work. Remove packaging material as soon as its contents have been removed. Collect waste and place in designated location.

B. On completion of work in each area, clean work debris and equipment. Keep areas free from dust, dirt, and debris.

C. On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.

3.18 Training

A. Provide training for a designated staff of Owner's representatives. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods.

B. Training shall enable students to accomplish the following objectives.

1. Proficiently operate system

2. Understand control system architecture and configuration

3. Understand DDC system components

4. Understand system operation, including DDC system control and optimizing routines (algorithms)

5. Operate workstation and peripherals

6. Log on and off system

7. Access graphics, point reports, and logs

8. Adjust and change system setpoints, time schedules, and holiday schedules

9. Recognize common HVAC system malfunctions by observing system graphics, trend graphs, and other system tools

10. Understand system drawings and Operation and Maintenance manual

11. Understand job layout and location of control components
12. Access data from DDC controllers
13. Operate portable operator's terminals
14. Create and change system graphics
15. Create, delete, and modify alarms, including configuring alarm reactions
16. Create, delete, and modify point trend logs (graphs) and multi-point trend graphs
17. Configure and run reports
18. Add, remove, and modify system's physical points
19. Create, modify, and delete application programming
20. Add operator interface stations
21. Add a new controller to system
22. Download firmware and advanced applications programming to a controller
23. Configure and calibrate I/O points
24. Maintain software and prepare backups
25. Interface with job-specific, third-party operator software
26. Add new users and understand password security procedures

C. Divide presentation of objectives into three sessions (1-13, 14-23, and 24-26). Participants will attend one or more of sessions, depending on knowledge level required.
   1. Day-to-day Operators (objectives 1-13)
   2. Advanced Operators (objectives 1-13 and 14-23)
   3. System Managers and Administrators (objectives 1-13 and 24-26)

D. Provide course outline and materials according to Section 15900 Article 1.10 (Submittals). Provide one copy of training material per student.

E. Instructors shall be factory-trained and experienced in presenting this material.

F. Perform classroom training using a network of working controllers representative of installed hardware.

3.19 Sequence of Operation

See Section 15900 Appendix A (Sequences of Operation).

3.20 Points List

Points lists are integrated into Section 15900 Appendix A (Sequences of Operation).

APPENDIX A: Sequences of Operation

1. **Single Air Cooled Chiller (typical of 1)**

   Chiller – Run Conditions:
   The chiller shall be enabled to run whenever:

   - A definable number of chilled water coils need cooling
   - AND the outside air temperature is greater than 54°F (adj.).

   To prevent short cycling, the chiller shall run for and be off for minimum adjustable times (both user definable), unless shutdown on safeties or outside air conditions.

   The chiller shall run subject to its own internal safeties and controls.

   Emergency Shutdown:
   The chiller shall shut down and an alarm generated upon receiving an emergency shut-down signal status.

   Chilled Water Isolation Valve:
   The valve shall open anytime the chiller is called to run. The valve shall also open whenever the chilled water pump runs for freeze protection.

   The valve shall open prior to the chiller being enabled and shall close only after the chiller is disabled. The valve shall therefore have:

   - A user adjustable delay on start.
   - AND a user adjustable delay on stop.

   The delay times shall be set appropriately to allow for orderly chilled water system start-up, shutdown and sequencing.

   Alarms shall be provided as follows:

   - Failure: Valve commanded open but the status indicates closed.
   - Open in Hand: Valve commanded closed but the status indicates open.
   - Runtime Exceeded: Valve status runtime exceeds a user-definable limit.

   Chilled Water Pump Lead/Standby Operation:
   The two chilled water pumps shall run anytime the chiller is called to run. The chilled water pump shall also run for freeze protection whenever the outside air temperature is less than a user definable setpoint (adj.).

The lead pump shall start prior to the chiller being enabled and shall stop only after the chiller is disabled. The pump(s) shall therefore have:

- A user adjustable delay on start.
- AND a user adjustable delay on stop.

The delay times shall be set appropriately to allow for orderly chilled water system start-up, shutdown and sequencing.

The two pumps shall operate in a lead/standby fashion.

- The lead pump shall run first.
- On failure of the lead pump, the standby pump shall run and the lead pump shall turn off.

The designated lead pump shall rotate upon one of the following conditions (user selectable):

- manually through a software switch
- if pump runtime (adj.) is exceeded
- daily
- weekly
- monthly

Alarms shall be provided as follows:

- Chilled Water Pump 1
    - Failure: Commanded on, but the status is off.
    - Running in Hand: Commanded off, but the status is on.
    - Runtime Exceeded: Status runtime exceeds a user definable limit.
    - VFD Fault.

- Chilled Water Pump 2
    - Failure: Commanded on, but the status is off.
    - Running in Hand: Commanded off, but the status is on.
    - Runtime Exceeded: Status runtime exceeds a user definable limit.
    - VFD Fault.

Chilled Water Differential Pressure Control:
The controller shall measure chilled water differential pressure and modulate the lead chilled water pump VFD to maintain its chilled water differential pressure setpoint. The following setpoints are recommended values. All setpoints shall be field adjusted during the commissioning period to meet the requirements of actual field conditions.

The controller shall modulate chilled water pump speed to maintain a chilled water differential pressure of $12 lb_f/in^2$ (adj.). The VFD minimum speed shall not drop below 10% (adj.).

Alarms shall be provided as follows:

- High Chilled Water Differential Pressure: If the chilled water differential pressure is 25% (adj.) greater than setpoint.
- Low Chilled Water Differential Pressure: If the chilled water differential pressure is 25% (adj.) less than setpoint.

Chilled Water Bypass Valve – Minimum Flow Control:
The controller shall measure chilled water flow through the chiller and, as the chilled water flow drops below setpoint, the controller shall modulate the chilled water bypass valve open to maintain the minimum chilled water flow setpoint.

Alarms shall be provided as follows:

- Low Chilled Water Flow: If the chilled water flow is 25% (adj.) less than setpoint.

Chiller:
The chiller shall be enabled a user adjustable time after pump statuses are proven on. The chiller shall therefore have a user adjustable delay on start.

The delay time shall be set appropriately to allow for orderly chilled water system start-up, shutdown and sequencing.

The chiller shall run subject to its own internal safeties and controls.

Alarms shall be provided as follows:

- Chiller Failure: Commanded on, but the status is off.
- Chiller Running in Hand: Commanded off, but the status is on.
- Chiller Runtime Exceeded: Status runtime exceeds a user definable limit.

Chilled Water Supply Temperature Setpoint:
The chilled water supply temperature setpoint shall reset based on outside air tempera-

ture.

As outside air temperature drops from 75°F (adj.) to 50°F (adj.) the chilled water supply temperature setpoint shall reset upwards by adding from 0°F (adj.) to 10°F (adj.) to the current setpoint.

Chilled Water Temperature Monitoring:
The following temperatures shall be monitored:

- Chilled water supply.
- Chilled water return.

Alarms shall be provided as follows:

- High Chilled Water Supply Temp: If the chilled water supply temperature is greater than 55°F (adj.).
- Low Chilled Water Supply Temp: If the chilled water supply temperature is less than 38°F (adj.).

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Chilled Water Differential Pressure	×							×		×
Chilled Water Flow	×							×		×
Chilled Water Return Temp	×							×		×
Chilled Water Supply Temp	×							×		×
Chilled Water Pump 1 VFD Speed		×						×		×
Chilled Water Pump 2 VFD Speed		×						×		×
Chilled Water Bypass Valve		×						×		×
Chilled Water Supply Temp Setpoint Reset		×						×		×
Emergency Shutdown			×					×	×	×
Chilled Water Isolation Valve Status			×					×		×
Chilled Water Pump 1 Status			×					×		×
Chilled Water Pump 2 Status			×					×		×
Chilled Water Pump 1 VFD Fault			×						×	×

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Chilled Water Pump 2 VFD Fault			×						×	×
Chiller Status			×					×		×
Chilled Water Isolation Valve				×						×
Chilled Water Pump 1 Start/Stop				×				×		×
Chilled Water Pump 2 Start/Stop				×				×		×
Chiller Enable				×						×
Chilled Water Differential Pressure Setpoint					×			×		×
Chilled Water Flow Setpoint					×			×		×
Outside Air Temp					×					×
Chilled Water Isolation Valve Failure									×	
Chilled Water Isolation Valve in Hand									×	
Chilled Water Isolation Valve Runtime Exceeded									×	
Chilled Water Pump 1 Failure									×	
Chilled Water Pump 2 Failure									×	
Chilled Water Pump 1 Running in Hand									×	
Chilled Water Pump 2 Running in Hand									×	
Chilled Water Pump 1 Runtime Exceeded									×	
Chilled Water Pump 2 Runtime Exceeded									×	
High Chilled Water Differential Pressure									×	
Low Chilled Water Differential Pressure									×	
Low Chilled Water Flow									×	
Chiller Failure									×	
Chiller Running in Hand									×	

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Chiller Runtime Exceeded									×	
High Chilled Water Supply Temp									×	
Low Chilled Water Supply Temp									×	
Totals	4	4	7	4	3	0	0	17	20	22

Total Hardware (19) Total Software (40)

2. Variable Air Volume – AHU (typical of 1)

Run Conditions – Requested:

The unit shall run whenever:

- Any zone is occupied.
- OR a definable number of unoccupied zones need heating or cooling.

Freeze Protection:

The unit shall shut down and generate an alarm upon receiving a freeze-stat status.

High Static Shutdown:

The unit shall shut down and generate an alarm upon receiving an high static shutdown signal.

Supply Air Smoke Detection:

The unit shall shut down and generate an alarm upon receiving a supply air smoke detector status.

Supply Fan:

The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.

Alarms shall be provided as follows:

- Supply Fan Failure: Commanded on, but the status is off.
- Supply Fan in Hand: Commanded off, but the status is on.
- Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

Supply Air Duct Static Pressure Control:

The controller shall measure duct static pressure and modulate the supply fan VFD speed to maintain a duct static pressure setpoint. The speed shall not drop below 30% (adj.). The static pressure setpoint shall be reset based on zone cooling requirements.

- The initial duct static pressure setpoint shall be 1.0in H_2O (adj.).

- As cooling demand increases, the setpoint shall incrementally reset up to a maximum of 1.5in H_2O (adj.).
- As cooling demand decreases, the setpoint shall incrementally reset down to a minimum of 0.75in H_2O (adj.) .

Alarms shall be provided as follows:

- High Supply Air Static Pressure: If the supply air static pressure is 25% (adj.) greater than setpoint.
- Low Supply Air Static Pressure: If the supply air static pressure is 25% (adj.) less than set-point.
- Supply Fan VFD Fault.

<u>Supply Air Temperature Setpoint - Optimized:</u>

The controller shall monitor the supply air temperature and shall maintain a supply air temperature setpoint reset based on zone cooling and heating requirements

The supply air temperature setpoint shall be reset for cooling based on zone cooling requirements as follows:

- The initial supply air temperature setpoint shall be 55°F (adj.).
- As cooling demand increases, the setpoint shall incrementally reset down to a minimum of 52°F (adj.).
- As cooling demand decreases, the setpoint shall incrementally reset up to a maximum of 70°F (adj.) .

If more zones need heating than cooling, then the supply air temperature setpoint shall be reset for heating as follows:

- The initial supply air temperature setpoint shall be 82°F (adj.).
- As heating demand increases, the setpoint shall incrementally reset up to a maximum of 85°F (adj.).
- As heating demand decreases, the setpoint shall incrementally reset down to a minimum of 72°F (adj.).

<u>Cooling Coil Valve:</u>

The controller shall measure the supply air temperature and modulate the cooling coil valve to maintain its cooling setpoint.

The cooling shall be enabled whenever:

- Outside air temperature is greater than 60°F (adj.).
- AND the economizer (if present) is disabled or fully open.
- AND the supply fan status is on.
- AND the heating (if present) is not active.

The cooling coil valve shall open to 50% (adj.) whenever the freezestat (if present) is on.

Alarms shall be provided as follows:

- High Supply Air Temp: If the supply air temperature is 5°F (adj.) greater than setpoint.

Electric Heating Stages:

The controller shall measure the supply air temperature and stage the heating to maintain its heating setpoint. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.

The heating shall be enabled whenever:

- Outside air temperature is less than 65°F (adj.).
- AND the supply fan status is on.
- AND the cooling (if present) is not active.

The heating stages shall run for freeze protection whenever:

- Supply air temperature drops from 40°F to 35°F (adj.).
- AND the supply fan status is on.

Alarms shall be provided as follows:

- Low Supply Air Temp: If the supply air temperature is 5°F (adj.) less than setpoint.

Economizer:

The controller shall measure the mixed air temperature and modulate the economizer dampers in sequence to maintain a setpoint 2°F (adj.) less than the supply air temperature setpoint. The outside air dampers shall

maintain a minimum adjustable position of 20% (adj.) open whenever occupied.

The economizer shall be enabled whenever:

- Outside air temperature is less than 65°F (adj.).
- AND the outside air enthalpy is less than 22Btu/lb (adj.)
- AND the outside air temperature is less than the return air temperature.
- AND the outside air enthalpy is less than the return air enthalpy.
- AND the supply fan status is on.

The economizer shall close whenever:

- Mixed air temperature drops from 40°F to 35°F (adj.)
- OR the freezestat (if present) is on.
- OR on loss of supply fan status.

The outside and exhaust air dampers shall close and the return air damper shall open when the unit is off. If Optimal Start Up is available the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.

<u>Minimum Outside Air Ventilation – Carbon Dioxide (CO2) Control:</u>
When in the occupied mode, the controller shall measure the return air CO2 levels and modulate the outside air dampers open on rising CO2 concentrations, overriding normal damper operation to maintain a CO2 setpoint of 750 ppm (adj.).

<u>Prefilter Differential Pressure Monitor:</u>
The controller shall monitor the differential pressure across the prefilter.

Alarms shall be provided as follows:

- Prefilter Change Required: Prefilter differential pressure exceeds a user definable limit (adj.).

<u>Mixed Air Temperature:</u>
The controller shall monitor the mixed air temperature and use as re-

quired for economizer control (if present) or preheating control (if present).

Alarms shall be provided as follows:

- High Mixed Air Temp: If the mixed air temperature is greater than 90°F (adj.).
- Low Mixed Air Temp: If the mixed air temperature is less than 45°F (adj.).

Return Air Carbon Dioxide (CO2) Concentration Monitoring:
The controller shall measure the return air CO2 levels.

Alarms shall be provided as follows:

- High Return Air Carbon Dioxide Concentration: If the return air CO2 concentration is greater than 1000ppm (adj.) when in the unit is running.

Return Air Humidity:
The controller shall monitor the return air humidity and use as required for economizer control (if present) or humidity control (if present).

Alarms shall be provided as follows:

- High Return Air Humidity: If the return air humidity is greater than 70% (adj.).
- Low Return Air Humidity: If the return air humidity is less than 35% (adj.).

Return Air Temperature:
The controller shall monitor the return air temperature and use as required for setpoint control or economizer control (if present).

Alarms shall be provided as follows:

- High Return Air Temp: If the return air temperature is greater than 90°F (adj.).
- Low Return Air Temp: If the return air temperature is less than 45°F (adj.).

Supply Air Temperature:
The controller shall monitor the supply air temperature.

Alarms shall be provided as follows:

- High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
- Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Supply Air Static Pressure	×							×	×	×
Prefilter Differential Pressure	×							×		
Mixed Air Temp	×							×		×
Return Air Carbon Dioxide PPM	×							×		×
Return Air Humidity	×							×		×
Return Air Temp	×							×		×
Supply Air Temp	×							×		×
Supply Fan VFD Speed		×						×		×
Cooling Valve		×						×		×
Mixed Air Dampers		×						×		×
Freezestat			×					×	×	×
High Static Shutdown			×					×	×	×
Supply Air Smoke Detector			×					×	×	×
Supply Fan VFD Fault			×						×	×
Supply Fan Status			×					×		×
Supply Fan Start/Stop				×				×		×
Heating Stage 1				×				×		×
Heating Stage 2				×				×		×
Heating Stage 3				×				×		×
Supply Air Static Pressure Set-point					×			×		×
Supply Air Temp Setpoint					×			×		×
Economizer Mixed Air Temp Setpoint					×			×		×
RA Carbon Dioxide PPM Setpoint					×			×		×
High Supply Air Static Pressure									×	
Low Supply Air Static Pressure									×	
Supply Fan Failure									×	
Supply Fan in Hand									×	
Supply Fan Runtime Exceeded									×	

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
High Supply Air Temp									×	
Low Supply Air Temp									×	
Prefilter Change Required									×	×
High Mixed Air Temp									×	
Low Mixed Air Temp									×	
High Return Air Carbon Dioxide Concentration									×	
High Return Air Humidity									×	
Low Return Air Humidity									×	
High Return Air Temp									×	
Low Return Air Temp									×	
High Supply Air Temp									×	
Low Supply Air Temp									×	
Totals	7	3	5	4	4	0	0	22	22	23

Total Hardware (19) Total Software (48)

3. **Variable Air Volume – Terminal Unit (typical of 4)**

Run Conditions – Scheduled:

The unit shall run according to a user definable time schedule in the following modes:

- Occupied Mode: The unit shall maintain
    - A 74°F (adj.) cooling setpoint
    - A 70°F (adj.) heating setpoint.
- Unoccupied Mode (night setback): The unit shall maintain
    - A 85°F (adj.) cooling setpoint.
    - A 55°F (adj.) heating setpoint.

Alarms shall be provided as follows:

- High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
- Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).

Demand Limiting – Zone Setpoint Optimization:

To lower power consumption, the zone setpoints shall automatically relax when the facility power consumption exceeds definable thresholds. The amount of relaxation shall be individually configurable for each zone. The zone setpoints shall automatically return to their previous settings when the facility power consumption drops below the thresholds.

Zone Setpoint Adjust:

The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.

Zone Optimal Start:

The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.

Zone Unoccupied Override:

A timed local override control shall allow an occupant to override the schedule and place the unit into an occupied mode for an adjustable pe-

riod of time. At the expiration of this time, control of the unit shall automatically return to the schedule.

Reversing Variable Volume Terminal Unit - Flow Control:

The unit shall maintain zone setpoints by controlling the airflow through one of the following:

Occupied:

- When zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum occupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
- When the zone temperature is between the cooling setpoint and the heating setpoint, the zone damper shall maintain the minimum required zone ventilation (adj.).
- When zone temperature is less than its heating setpoint, the controller shall enable heating to maintain the zone temperature at its heating setpoint. Additionally, if warm air is available from the AHU, the zone damper shall modulate between the minimum occupied airflow (adj.) and the maximum heating airflow (adj.) until the zone is satisfied.

Unoccupied:

- When the zone is unoccupied the zone damper shall control to its minimum unoccupied airflow (adj.).
- When the zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum unoccupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
- When zone temperature is less than its unoccupied heating setpoint, the controller shall enable heating to maintain the zone temperature at the setpoint. Additionally, if warm air is available from the AHU, the zone damper shall modulate between the minimum unoccupied airflow (adj.) and the auxiliary heating airflow (adj.) until the zone is satisfied.

Electric Reheating Stages:

The controller shall measure the zone temperature and stage the reheating to maintain its setpoint. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.

The reheating shall be enabled whenever:

- Outside air temperature is less than 65°F (adj.).
- AND the zone temperature is below setpoint.

- AND sufficient airflow is provided.

Reheating – High Discharge Air Temperature Limit:
The controller shall measure the discharge air temperature and limit re-heating if the discharge air temperature is more than 15°F (adj.) above the zone temperature.

Discharge Air Temperature:
The controller shall monitor the discharge air temperature.

Alarms shall be provided as follows:

- High Discharge Air Temp: If the discharge air temperature is greater than 120°F (adj.).
- Low Discharge Air Temp: If the discharge air temperature is less than 40°F (adj.).

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Airflow	×							×		×
Discharge Air Temp	×							×		×
Zone Damper		×								×
Zone Override			×					×		×
Reheating Stage 1				×				×		×
Reheating Stage 2				×				×		×
Airflow Setpoint					×			×		×
Heating Mode						×		×		
Schedule							×			
Heating Setpoint								×		×
Cooling Setpoint								×		×
High Zone Temp									×	
Low Zone Temp									×	
High Discharge Air Temp									×	
Low Discharge Air Temp									×	
Totals	4	1	1	2	1	1	1	10	4	11

Total Hardware (8) Total Software (17)

4. Fan Coil Unit (typical of 10)

Run Conditions - Scheduled:

The unit shall run according to a user definable time schedule in the following modes:

- Occupied Mode: The unit shall maintain
    - A 74°F (adj.) cooling setpoint
    - A 70°F (adj.) heating setpoint.
- Unoccupied Mode (night setback): The unit shall maintain
    - A 85°F (adj.) cooling setpoint.
    - A 55°F (adj.) heating setpoint.

Alarms shall be provided as follows:

- High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
- Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).

Demand Limiting - Zone Setpoint Optimization:

To lower power consumption, the zone setpoints shall automatically relax when the facility power consumption exceeds definable thresholds. The amount of relaxation shall be individually configurable for each zone. The zone setpoints shall automatically return to their previous settings when the facility power consumption drops below the thresholds.

Zone Setpoint Adjust:

The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.

Zone Optimal Start:

The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.

Zone Unoccupied Override:

A timed local override control shall allow an occupant to override the schedule and place the unit into an occupied mode for an adjustable pe-

riod of time. At the expiration of this time, control of the unit shall automatically return to the schedule.

Smoke Detection:
The unit shall shut down and generate an alarm upon receiving a smoke detector status.

Fan:
The fan shall run anytime the unit is commanded to run, unless shutdown on safeties.

Cooling Coil Valve:
The controller shall measure the zone temperature and modulate the cooling coil valve to maintain its cooling setpoint.

The cooling shall be enabled whenever:

- Outside air temperature is greater than 60°F (adj.).
- AND the zone temperature is above cooling setpoint.
- AND the fan is on.

The cooling coil valve shall open whenever the freezestat (if present) is on.

Electric Heating Stages:
The controller shall measure the zone temperature and stage the heating to maintain its heating setpoint. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.

The heating shall be enabled whenever:

- Outside air temperature is less than 65°F (adj.).
- AND the zone temperature is below heating setpoint.
- AND the fan is on.

Filter Differential Pressure Monitor:
The controller shall monitor the differential pressure across the filter.

Alarms shall be provided as follows:

- Filter Change Required: Filter differential pressure exceeds a user definable limit (adj.).

Fan Status:

The controller shall monitor the fan status.

Alarms shall be provided as follows:

- Fan Failure: Commanded on, but the status is off.
- Fan in Hand: Commanded off, but the status is on.
- Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Zone Temp	×							×		×
Zone Setpoint Adjust	×									×
Filter Differential Pressure	×							×		×
Cooling Valve		×						×		×
Zone Override			×					×		×
Smoke Detector			×					×	×	×
Fan Status			×							×
Fan Start/Stop				×				×		×
Heating Stage 1				×				×		×
Heating Stage 2				×				×		×
Schedule							×			
Heating Setpoint								×		×
Cooling Setpoint								×		×
High Zone Temp									×	
Low Zone Temp									×	
Filter Change Required									×	
Fan Failure									×	
Fan in Hand									×	
Fan Runtime Exceeded									×	
Totals	3	1	3	3	0	0	1	10	7	12

	Hardware Points				Software Points					
Point Name	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic

Total Hardware (10) Total Software (18)

Point Summary

		Hardware Points				Software Points					
Equipment Name	Qty	AI	AO	BI	BO	AV	BV	Sched	Trend	Alarm	Show On Graphic
Single Air Cooled Chiller (Typical of 1)	Each	4	4	7	4	3	0	0	17	20	22
	Total (x1)	**4**	**4**	**7**	**4**	**3**	**0**	**0**	**17**	**20**	**22**
Variable Air Volume – AHU (Typical of 1)	Each	7	3	5	4	4	0	0	22	22	23
	Total (x1)	**7**	**3**	**5**	**4**	**4**	**0**	**0**	**22**	**22**	**23**
Variable Air Volume – Terminal Unit (Typical of 4)	Each	4	1	1	2	1	1	1	10	4	11
	Total (x4)	**16**	**4**	**4**	**8**	**4**	**4**	**4**	**40**	**16**	**44**
Fan Coil Unit (Typical of 10)	Each	3	1	3	3	0	0	1	10	7	12
	Total (x10)	**30**	**10**	**30**	**30**	**0**	**0**	**10**	**100**	**70**	**120**

Project Totals	**57**	**21**	**46**	**46**	**11**	**4**	**14**	**179**	**128**	**209**

Total Hardware (170) **Total Software (336)**

APPENDIX B: Glossary of Terms

Terms used within the Specification Text:

- Advanced Application Controller (AAC):

  A fully programmable control module. This control module may be capable of some of the advanced features found in Building Controllers (storing trends, initiating read and write requests, etc.) but it does not serve as a master controller. Advanced Application Controllers may reside on either the Ethernet/IP backbone or on a subnet.

- Application Specific Controller (ASC):

  A pre-programmed control module which is intended for use in a specific application. ASCs may be configurable, in that the user can choose between various pre-programmed options, but it does not support full custom programming. ASCs are often used on terminal equipment such as VAV boxes or fan coil units. In many vendors' architectures ASCs do not store trends or schedules but instead rely upon a Building Controller to provide those functions.

- BACnet/IP:

  An approved BACnet network type which uses an Ethernet carrier and IP addressing.

- BACnet MS/TP:

  An approved BACnet network type which uses a Master-Slave Token Passing configuration. MS/TP networks are unique to BACnet and utilize EIA485 twisted pair topology running at 9600 to 76,800 bps.

- BACnet over ARCNET:

  An approved BACnet network type which uses an ARCNET (attached resource computer network) carrier. ARCNET is an industry standard that can utilize several speeds and wiring standards. The most common configuration used by BACnet controllers is an EIA485 twisted pair topology running at 156,000 bps.

- Building Controller (BC):

A fully programmable control module which is capable of storing trends and schedules, serving as a router to devices on a subnet, and initiating read and write requests to other controllers. Typically this controller is located on the Ethernet/IP backbone of the BAS. In many vendors' architectures a Building Controller will serve as a master controller, storing schedules and trends for controllers on a subnet underneath the Building Controller.

- Direct Digital Control (DDC):

  A control system in which a digital computer or microprocessor is directly connected to the valves, dampers, and other actuators which control the system, as opposed to indirectly controlling a system by resetting setpoints on an analog pneumatic or electronic controller.

- PICS – Protocol Implementation Conformance Statement:

  A written document, created by the manufacturer of a device, which identifies the particular options specified by BACnet that are implemented in the device.

- Smart Actuator (SA):

  An actuator which is controlled by a network connection rather than a binary or analog signal. (0-10v, 4-20mA, relay, etc.)

- Smart Sensor (SS):

  A sensor which provides information to the BAS via network connection rather than a binary or analog signal. (0-10000 ohm, 4-20mA, dry contact, etc.)

- Web services:

  Web services are a standard method of exchanging data between computer systems using the XML (extensible markup language) and SOAP (simple object access protocol) standards. Web services can be used at any level within a Building Automation System (BAS), but most commonly they are used to transfer data between BAS using different protocols or

between a BAS and a non-BAS system such as a tenant billing system or a utility management system.

Terms used within the Sequences of Operation:

- adj.

  Adjustable by the end user, through the supplied user interface.

- AI, AO, etc. (Column Headings on Points List)

  AI = Analog Input. A physical input to the control module.
  AO = Analog Output. A physical output from the control module.
  AV = Analog Value. An intermediate (software) point that may be editable or read-only. Editable AVs are typically used to allow the user to set a fixed control parameter, such as a setpoint. Read Only AVs are typically used to display the status of a control operation.
  BI = Binary Input. A physical input to the control module.
  BO = Binary Output. A physical output from the control module.
  BV = Binary Value. An intermediate (software) point that may be editable or read-only. Editable BVs are typically used to allow the user to set a fixed control parameter, such as a setpoint. Read Only BVs are typically used to display the status of a control operation.
  Sched = Schedule. The control algorithm for this equipment shall include a user editable schedule.
  Trend. The control system shall be configured to collect and display a trend log of this object. The trending interval shall be no less than one sample every 5 minutes. (Change of Value trending, where a sample is taken every time the value changes by more than a user-defined minimum, is an acceptable alternative.)
  Alarm. The control system shall be configured to generate an alarm when this object exceeds user definable limits, as described in the Sequence of Controls.

  Note: If the specifications require use of the BACnet protocol, all of the above shall be provided as BACnet objects.

- KW Demand Limiting: *

An energy management strategy that reduces energy consumption when a system's electric power meter exceeds an operator-defined threshold.

When power consumption exceeds defined levels, the system automatically adjust setpoints, de-energizes low priority equipment, and takes other pre-programmed actions to avoid peak demand charges. As the demand drops, the system restores loads in a predetermined manner.

- Occupant Override Switch, or Timed Local Override:

  A control option that allows building occupants to override the programmed HVAC schedule for a limited period of time.

  When the override time expires, the zone returns to its unoccupied state.

- Occupant Setpoint Adjustment:

  A control option that allows building occupants to adjust - within limits set by the HVAC control system - the heating and cooling setpoints of selected zones. Typically the user interface for this function is built into the zone sensor.

- Optimal Start-Up: *

  A control strategy that automatically starts an HVAC system at the latest possible time yet ensures comfort conditions by the time the building becomes occupied.

  In a typical implementation, a controller measures the temperature of the zone and the outside air. Then, using design heating or cooling capacity at the design outside air temperature, the system computes how long a unit must run at maximum capacity to bring the zone temperature to its occupied setpoint.

  The optimal start algorithm often includes a self-learning feature to adjust for variations from design capacity.

  A distributed system must use Run on Request with Optimal Start. (See below.)

- Requested, or Run on Request: *

A control strategy that optimizes the runtime of a source piece of equipment that supplies one or more receiving units - such as an air handler unit supplying zone terminal units with heating, cooling, ventilation, or similar service. Source equipment runs only when needed, not on a fixed schedule.

The source equipment runs when one or more receiving units request its services. An operator determines how many requests are required to start the source equipment.

For example, if all the zones in a building are unoccupied and the zone terminal units do not need heating or cooling, the AHU will shut down. However, if a zone becomes occupied or needs cooling, the terminal unit will send a run request to the AHU to initiate the start-up sequence. If this AHU depends on a central chiller, it can send a run request to the chiller.

The run on request algorithm also allows an operator to schedule occupancy for individual zones based on the needs of the occupants without having to adjust the schedules of related AHUs and chillers.

- Trim and Respond, or Setpoint Optimization: *

  A control strategy that optimizes the setpoint of a source piece of equipment that supplies one or more receiving units - such as an air handler unit supplying zone terminal units with heating, cooling, ventilation, or similar service.

  The source unit communicates with receiving units to determine heating, cooling, and other requirements, and then adjusts its setpoint.

  For example, if all zones are comfortable and do not request cooling, the AHU will gradually increase (trim) its supply air setpoint. When a zone requests cooling, the AHU responds by dropping its setpoint. The more zones that request cooling, the more it drops the setpoint. The AHU repeats this process throughout the day to keep zones cool, but with a supply air setpoint that is no cooler than necessary.

Contracting Terms:

- Furnished or Provided:

  The act of supplying a device or piece of equipment as required meeting the scope of work specified and making that device or equipment operational. All costs required to furnish the specified device or equipment and make it operational are borne by the division specified to be responsible for providing the device or equipment.

- Install or Installed:

  The physical act of mounting, piping or wiring a device or piece of equipment in accordance with the manufacturer's instructions and the scope of work as specified. All costs required to complete the installation are borne by the division specified to include labor and any ancillary materials.

- Interface:

  The physical device required to provide integration capabilities from an equipment vendor's product to the control system. The equipment vendor most normally furnishes the interface device. An example of an interface is the chilled water temperature reset interface card provided by the chiller manufacturer in order to allow the control system to integrate the chilled water temperature reset function into the control system.

- Integrate:

  The physical connections from a control system to all specified equipment through an interface as required to allow the specified control and monitoring functions of the equipment to be performed via the control system.

APPENDIX C: Abbreviations

The following abbreviations may be used in graphics, schematics, point names, and other UI applications where space is at a premium.

AC - Air Conditioning
ACU - Air Conditioning Unit
AHU - Air Handling Unit
AI - Analog Input
AO - Analog Output
AUTO - Automatic
AUX - Auxiliary
BI - Binary Input
BO - Binary Output
C - Common
CHW - Chilled Water
CHWP - Chilled Water Pump
CHWR - Chilled Water Return
CHWS - Chilled Water Supply
COND - Condenser
CW - Condenser Water
CWP - Condenser Water Pump
CWR - Condenser Water Return
CWS - Condenser Water Supply
DA - Discharge Air
EA - Exhaust Air

EF - Exhaust Fan
EVAP - Evaporators
FCU - Fan Coil Unit
HOA - Hand / Off / Auto
HP - Heat Pump
HRU - Heat Recovery Unit
HTEX - Heat Exchanger
HW - Hot Water
HWP - Hot Water Pump
HWR - Hot Water Return
HWS - Hot Water Supply
MAX - Maximum
MIN - Minimum
MISC - Miscellaneous
NC - Normally Closed
NO - Normally Open
OA - Outdoor Air
PIU - Powered Induction Unit
RA - Return Air
RF - Return Fan
RH - Relative Humidity
RTU - Roof-top Unit
SA - Supply Air
SF - Supply Fan
SP - Static Pressure
TEMP - Temperature

UH - Unit Heater
UV - Unit Ventilator
VAV - Variable Air Volume
VVTU - Variable Volume Terminal Unit
W/ - with
W/O - without
WSHP - Water Source Heat Pump

SECTION 15950 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Certified TAB reports.

B. TAB Firm Qualifications: AABC NEBB or TABB certified.

C. TAB Report Forms: Standard TAB contractor's forms approved by Architect.

D. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine the approved submittals for HVAC systems and equipment.

C. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

D. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

E. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

F. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

G. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.

3. Integrity of dampers and valves for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to indicated values.

H. Report deficiencies discovered before and during performance of test and balance procedures.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in ASHRAE 111 NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.3 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare schematic diagrams of systems' "as-built" duct layouts.

B. For variable-air-volume systems, develop a plan to simulate diversity.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Verify that motor starters are equipped with properly sized thermal protection.

E. Check for airflow blockages.

F. Check condensate drains for proper connections and functioning.

G. Check for proper sealing of air-handling unit components.

H. Check for proper sealing of air duct system.

3.4 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data; number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
4. Set system controls so automatic valves are wide open to heat exchangers.
5. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.

3.5 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

END OF SECTION 15950

SECTION 16060 - GROUNDING AND BONDING

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

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

PART 2 - PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Burndy; Part of Hubbell Electrical Systems.

Dossert; AFL Telecommunications LLC.

ERICO International Corporation.

Fushi Copperweld Inc.

Galvan Industries, Inc.; Electrical Products Division, LLC.

Harger Lightning and Grounding.

ILSCO.

O-Z/Gedney; A Brand of the EGS Electrical Group.

Robbins Lightning, Inc.

Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

Solid Conductors: ASTM B 3.
Stranded Conductors: ASTM B 8.
Tinned Conductors: ASTM B 33.
Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 - PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install barecopper conductor, size as indicated.

Bury at least 24 inches (600 mm) below grade.

C. Conductor Terminations and Connections:

Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
Underground Connections: Welded connectors except at test wells and as otherwise indicated.
Connections to Ground Rods at Test Wells: Bolted connectors.
Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

Feeders and branch circuits.
Lighting circuits.
Receptacle circuits.

Single-phase motor and appliance branch circuits.
Three-phase motor and appliance branch circuits.
Flexible raceway runs.
Armored and metal-clad cable runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to

main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION 16060

SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Identification for raceways.
Identification of power and control cables.
Identification for conductors.
Underground-line warning tape.
Warning labels and signs.
Instruction signs.
Equipment identification labels.
Miscellaneous identification products.

1.2 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

Black letters on an orange field.
Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

D. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.4 UNDERGROUND-LINE WARNING TAPE

A. Tape:

Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
Printing on tape shall be permanent and shall not be damaged by burial operations.
Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2.5 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
1/4-inch (6.4-mm) grommets in corners for mounting.

Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:

Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
1/4-inch (6.4-mm) grommets in corners for mounting.

Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.6 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

Engraved legend with white letters on black face.
Punched or drilled for mechanical fasteners.
Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.7 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

B. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - PART 3 - EXECUTION

3.1 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of

two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

G. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Install labels at 30-foot (10-m) maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

Power.
Fire Alarm.
Communications.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service and feeder conductors.

Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
Colors for 208/120-V Circuits:

Phase A: Black.
Phase B: Red.
Phase C: Blue.

Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

Comply with 29 CFR 1910.145.
Identify system voltage with black letters on an orange background.
Apply to exterior of door, cover, or other access.

F. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

Labeling Instructions:

Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
Outdoor Equipment: Engraved, laminated acrylic or melamine label.
Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 16075

SECTION 16120 - CONDUCTORS AND CABLES

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Building wires and cables rated 600 V and less.
Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

Section 16124 "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.
Section 16123 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2 and 3 control cables.
Section 16717 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, Type XHHW-2 and Type SO.

C. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 16130 "Raceways and Boxes" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to industry standard practice.

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

B. Test and Inspection Reports: Prepare a written report to record the following:

Procedures used.
Results that comply with requirements.
Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 16120

SECTION 16130 - RACEWAYS AND BOXES

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Metal conduits, tubing, and fittings.
Nonmetal conduits, tubing, and fittings.
Metal wireways and auxiliary gutters.
Boxes, enclosures, and cabinets.

1.2 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. IMC: Comply with ANSI C80.6 and UL 1242.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. FMC: Comply with UL 1; zinc-coated steel or aluminum.

F. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
Fittings for EMT:

Material: Steel or die cast.
Type: Setscrew or compression.

Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

C. RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or Type 3R unless otherwise indicated, and sized according to NFPA 70.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Not permitted.

2.5 SURFACE RACEWAYS

A. Not permitted.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: not permitted.

E. Metal Floor Boxes:

Material: Cast metal.
Type: Fully adjustable.
Shape: Rectangular.
Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Nonmetallic Floor Boxes: Not permitted.

G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

I. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum, or galvanized cast iron, with gasketed cover.

J. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

K. Gangable boxes are allowed.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 or Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.

Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
Nonmetallic Enclosures: not permitted.

Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

NEMA 250, Type 1 or Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
Hinged door in front cover with flush latch and concealed hinge.
Key latch to match panelboards.
Metal barriers to separate wiring of different systems and voltage.
Accessory feet where required for freestanding equipment.
Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

Exposed Conduit below 8ft a.f.g.: GRC, IMC.
Concealed Conduit or above 8ft a.f.g., Aboveground: GRC, IMC, EMT.
Underground Conduit: RNC, Type EPC-40-PVC.
Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

Exposed, Not Subject to Physical Damage: EMT.
Exposed, Not Subject to Severe Physical Damage: EMT.
Exposed and Subject to Severe Physical Damage: GRC or IMC. Raceway locations include the following:

Loading dock.
Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.

Concealed in Ceilings and Interior Walls and Partitions: EMT.

Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
Damp or Wet Locations: GRC or IMC.

C. Minimum Raceway Size: 1/2-inch (16-mm) trade size (branch circuits only), except 3/4-inch for all home-runs; 1-inch for all communication stub-ups.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
EMT: Use setscrew or compression, steel cast-metal fittings. Comply with NEMA FB 2.10.
Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Arrange stub-ups so curved portions of bends are not visible above finished slab.

D. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

F. Support conduit within 12 inches (300 mm)of enclosures to which attached.

G. Raceways Embedded in Slabs:

Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
Arrange raceways to cross building expansion joints at right angles with expansion fittings.
Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
Do not embed threadless fittings in concrete unless specifically approved by Engineer for each specific location.

H. Stub-ups to Above Recessed Ceilings:

Use EMT, IMC, or RMC for raceways.
Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35-mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12

inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

N. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

O. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
Where an underground service raceway enters a building or structure.
Where otherwise required by NFPA 70.

P. Expansion-Joint Fittings:

Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m).
Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F (0.06 mm per meter of length of straight run per degree C) of temperature change for PVC conduits.
Install expansion fittings at all locations where conduits cross building or structure expansion joints.
Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Q. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

Use LFMC in damp or wet locations subject to severe physical damage.
Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

R. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.

S. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

T. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

U. Locate boxes so that cover or plate will not span different building finishes.

V. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

W. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

X. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

Excavate trench bottom to provide firm and uniform support for conduit.
Install backfill and compact to match surrounding.
After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified elsewhere in project specifications.
Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.

For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

Underground Warning Tape: Comply with requirements in Section 16075 "Electrical Identification."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Handholes shall be open-bottom type, furnished with bolt-down covers.

E. Handholes/covers shall be listed as ANSI TIER 15.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16091 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies.

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 16130

SECTION 16140 - WIRING DEVICES

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Receptacles, receptacles with integral GFCI, and associated device plates.
Weather-resistant receptacles.
Snap switches and wall-box dimmers.
Solid-state fan speed controls.
Wall-switch and exterior occupancy sensors.
Communications outlets.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
Leviton Mfg. Company Inc. (Leviton).
Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

Connectors shall comply with UL 2459 and shall be made with stranding building wire.
Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

Cooper; 5351 (single), CR5362 (duplex).
Hubbell; HBL5351 (single), HBL5352 (duplex).
Leviton; 5891 (single), 5352 (duplex).

Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:

Straight blade, feed-through type.
Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

Cooper; VGF20.
Hubbell; GFR5352L.
Pass & Seymour; 2095.
Leviton; 7590.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

Single Pole:

Cooper; AH1221.

Hubbell; HBL1221.
Leviton; 1221-2.
Pass & Seymour; CSB20AC1.
Two Pole:

Cooper; AH1222.

Hubbell; HBL1222.
Leviton; 1222-2.
Pass & Seymour; CSB20AC2.
Three Way:

Cooper; AH1223.

Hubbell; HBL1223.
Leviton; 1223-2.
Pass & Seymour; CSB20AC3.
Four Way:

Cooper; AH1224.

Hubbell; HBL1224.
Leviton; 1224-2.
Pass & Seymour; CSB20AC4.

2.6 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider toggle switch; with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.

600 W; dimmers shall require no derating when ganged with other devices.

D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.7 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

Plate-Securing Screws: Metal with head color to match plate finish.
Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.

Material for Unfinished Spaces: Galvanized steel.
Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.8 FINISHES

A. Wall Plate Color: For plastic covers, match device color.

PART 3 - PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

Do not strip insulation from conductors until right before they are spliced or terminated on devices.
Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
Existing Conductors:

Cut back and pigtail, or replace all damaged conductors.
Straighten conductors that remain and remove corrosion and foreign matter.
Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
Use a torque screwdriver when a torque is recommended or required by manufacturer.
When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
Tighten unused terminal screws on the device.
When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

Install dimmers within terms of their listing.
Verify that dimmers used for fan speed control are listed for that application.

Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

Test Instruments: Use instruments that comply with UL 1436.

B. Tests for Convenience Receptacles:

Line Voltage: Acceptable range is 105 to 132 V.
Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
Ground Impedance: Values of up to 2 ohms are acceptable.
GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
Using the test plug, verify that the device and its outlet box are securely mounted.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 16140

SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Fusible switches.
Nonfusible switches.
Receptacle switches.
Molded-case circuit breakers (MCCBs).
Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 2 - PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

General Electric Company; GE Consumer & Industrial - Electrical Distribution.
Siemens Energy & Automation, Inc.
Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
Lugs: Suitable for number, size, and conductor material.
Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

Eaton Electrical Inc.; Cutler-Hammer Business Unit.

General Electric Company; GE Consumer & Industrial - Electrical Distribution.
Siemens Energy & Automation, Inc.
Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
Lugs: Suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

General Electric Company; GE Consumer & Industrial - Electrical Distribution.
Siemens Energy & Automation, Inc.
Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

Instantaneous trip.
Long- and short-time pickup levels.
Long- and short-time time adjustments.
Ground-fault pickup level, time delay, and I^2t response.

E. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

F. Features and Accessories:

Standard frame sizes, trip ratings, and number of poles.
Lugs: Suitable for number, size, trip ratings, and conductor material.
Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
Alarm Switch: One NO NC contact that operates only when circuit breaker has tripped.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

Indoor, Dry and Clean Locations: NEMA 250, Type 1.
Outdoor Locations: NEMA 250, Type 3R.

PART 3 - PART 3 - EXECUTION

3.1 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify per code and industry standard practice:

Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
Test continuity of each circuit.

C. Tests and Inspections:

Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 16410

SECTION 16442 - PANELBOARDS

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 ACTION SUBMITTALS

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

B. Shop Drawings: For each panelboard and related equipment.

Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
Detail enclosure types and details for types other than NEMA 250, Type 1.
Detail bus configuration, current, and voltage ratings.
Short-circuit current rating of panelboards and overcurrent protective devices.
Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

Warranty Period: one year from date of Substantial Completion.

PART 2 - PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and surface-mounted cabinets.

Rated for environmental conditions at installed location.

Indoor Dry and Clean Locations: NEMA 250, Type 1.
Outdoor Locations: NEMA 250, Type 3R.

Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

C. Conductor Connectors: Suitable for use with conductor material and sizes.

Material: Hard-drawn copper, 98 percent conductivity.
Main and Neutral Lugs: Mechanical type.
Ground Lugs and Bus Configured Terminators: Mechanical type.
Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

D. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

E. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, and listed and labeled for series-connected short-circuit rating by an NRTL.

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.3 DISTRIBUTION PANELBOARDS

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

General Electric Company; GE Consumer & Industrial - Electrical Distribution.

Siemens Energy & Automation, Inc.

Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

D. Mains: Circuit breaker OR Lugs only, as indicated.

E. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

G. Branch Overcurrent Protective Devices: Fused switches.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

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

Eaton Electrical Inc.; Cutler-Hammer Business Unit.

General Electric Company; GE Consumer & Industrial - Electrical Distribution.

Siemens Energy & Automation, Inc.

Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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

General Electric Company; GE Consumer & Industrial - Electrical Distribution.

Siemens Energy & Automation, Inc.

Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

Instantaneous trip.
Long- and short-time pickup levels.
Long- and short-time time adjustments.
Ground-fault pickup level, time delay, and I^2t response.

Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

Standard frame sizes, trip ratings, and number of poles.
Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

PART 3 - PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store and install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 78” above finished floor unless otherwise indicated.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install overcurrent protective devices and controllers not already factory installed.

Set field-adjustable, circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

G. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as required by code and industry standard practice.

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with an engraved nameplate.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
Test continuity of each circuit.

C. Tests and Inspections:

Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

END OF SECTION 16442

SECTION 16511 - LIGHTING

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Interior lighting fixtures, lamps, and ballasts.
Emergency lighting units.
Exit signs.
Lighting fixture supports.
Lighting controls.

B. Related Sections:

Section 16140 "Wiring Devices".

1.2 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 2 - PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

C. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

G. Diffusers and Globes:

Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
Glass: Annealed crystal glass unless otherwise indicated.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:

Comply with UL 935 and with ANSI C82.11.
Designed for type and quantity of lamps served.

Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
Sound Rating: Class A.
Total Harmonic Distortion Rating: Less than 20 percent.
Operating Frequency: 42 kHz or higher.
Lamp Current Crest Factor: 1.7 or less.
BF: 0.88 or higher.
Power Factor: 0.95 or higher.

B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

Dimming Range: 100 to 5 percent of rated lamp lumens.
Ballast Input Watts: Can be reduced to 20 percent of normal.
Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
Control: Coordinate wiring from ballast to control device to ensure that the ballast, controller, and connecting wiring are compatible.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

Lamp end-of-life detection and shutdown circuit.
Automatic lamp starting after lamp replacement.
Sound Rating: Class A.
Total Harmonic Distortion Rating: Less than 20 percent.
Operating Frequency: 20 kHz or higher.
Lamp Current Crest Factor: 1.7 or less.
BF: 0.95 or higher unless otherwise indicated.
Power Factor: 0.95 or higher.
Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.5 EMERGENCY FLUORESCENT POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.

Emergency Connection: Operate one fluorescent lamp(s) continuously at an output of 1400 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
Nightlight Connection: Operate one fluorescent lamp continuously.
Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

Battery: Sealed, maintenance-free, nickel-cadmium type.
Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.

2.6 BALLASTS FOR HID LAMPS

A. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features unless otherwise indicated:

Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
Minimum Starting Temperature: Minus 22 deg F (Minus 30 deg C) for single-lamp ballasts.
Rated Ambient Operating Temperature: 104 deg F (40 deg C).
Open-circuit operation that will not reduce average life.

B. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:

Minimum Starting Temperature: Minus 20 deg F (Minus 29 deg C) for single-lamp ballasts.
Rated Ambient Operating Temperature: 130 deg F (54 deg C).
Lamp end-of-life detection and shutdown circuit.
Sound Rating: Class A.
Total Harmonic Distortion Rating: Less than 20 percent.

Lamp Current Crest Factor: 1.5 or less.
Power Factor: 0.90 or higher.
Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
Protection: Class P thermal cutout.

C. High-Pressure Sodium Ballasts: Electromagnetic type, with solid-state igniter/starter. Igniter/starter shall have an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.

Instant-Restrike Device: Integral with ballast, or solid-state potted module, factory installed within fixture and compatible with lamps, ballasts, and mogul sockets up to 150 W.
Minimum Starting Temperature: Minus 40 deg F (Minus 40 deg C).

2.7 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

Battery: Sealed, maintenance-free, nickel-cadmium type.
Charger: Fully automatic, solid-state type with sealed transfer relay.
Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.8 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

Battery: Sealed, maintenance-free, lead-acid type.
Charger: Fully automatic, solid-state type with sealed transfer relay.
Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.

2.9 AUTOMATIC LIGHTING CONTROLS

A. Lighting Control Relay Panel

Panel shall have NEMA-1 Enclosure.
Panel shall support up to 32 independently controlled relays.
Panel shall include electronic astronomical timeclock.
Panel shall include remote digital switch interface, keypad, and LCD display.
Basis of design is Greengate #LK32 Litekeeper.

B. Wall-Switch Sensor:

Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft. (84 sq. m).
Sensing Technology: Dual technology - PIR and ultrasonic.
Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
Voltage: Match the circuit voltage .

2.10 FLUORESCENT LAMPS

A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 4100 K, and average rated life 20,000 hours unless otherwise indicated.

B. T8 rapid-start lamps, rated 17 W maximum, nominal length of 24 inches (610 mm), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 4100 K, and average rated life of 20,000 hours unless otherwise indicated.

C. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 4100 K, average rated life of 10,000 hours at three hours operation per start unless otherwise indicated.

13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
32 W: T4, triple tube, rated 2400 initial lumens (minimum).
42 W: T4, triple tube, rated 3200 initial lumens (minimum).
57 W: T4, triple tube, rated 4300 initial lumens (minimum).
70 W: T4, triple tube, rated 5200 initial lumens (minimum).

2.11 HID LAMPS

A. High-Pressure Sodium Lamps: ANSI C78.42, CRI 21 (minimum), color temperature 1900 K, and average rated life of 24,000 hours, minimum.

B. Metal-Halide Lamps: ANSI C78.43, with minimum CRI 65, and color temperature 4000 K.

C. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000 K.

D. Ceramic, Pulse-Start, Metal-Halide Lamps: Minimum CRI 80, and color temperature 4000 K.

2.12 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

B. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

D. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

E. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Comply with NFPA 70 for minimum fixture supports.

C. Suspended Lighting Fixture Support:

Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers or cable.
Continuous Rows: Use tubing or stem for wiring at one point and tubing, cable, or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Adjust aimable lighting fixtures to provide required light intensities.

E. Connect wiring according to Section 16120 "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 16511

SECTION 16720 - FIRE-ALARM SYSTEM

PART 1 - PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Fire-alarm control unit.
Manual fire-alarm boxes.
System smoke detectors.
Heat detectors.
Notification appliances.
Remote annunciator.
Addressable interface device.
Digital alarm communicator transmitter.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

B. Shop Drawings: For fire-alarm system.

Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
Include plans, elevations, sections, details, and attachments to other work.
Provide a detailed riser diagram showing devices and wiring notes or schedule.
Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
Detail assembly and support requirements.
Include voltage drop calculations for notification-appliance circuits.
Include battery-size calculations.
Include performance parameters and installation details for each detector.
Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

In addition to items specified elsewhere, include the following:

Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
Complete wiring diagrams showing connections between all devices and equipment.
Riser diagram.
Record copy of site-specific software.
Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

Equipment tested.
Frequency of testing of installed components.
Frequency of inspection of installed components.
Requirements and recommendations related to results of maintenance.
Manufacturer's user training manuals.

Manufacturer's required maintenance related to system warranty requirements.
Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
Warranty Period: Two years from date of Substantial Completion.

PART 2 - PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

B. Automatic sensitivity control of certain smoke detectors.

C. All components provided shall be listed for use with the selected system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

Manual stations.
Heat detectors.
Smoke detectors.
Duct smoke detectors.
Automatic sprinkler system water flow.

B. Fire-alarm signal shall initiate the following actions:

Continuously operate alarm notification appliances.
Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
Transmit an alarm signal to the remote alarm receiving station.

Unlock electric door locks in designated egress paths.
Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
Activate emergency lighting control.
Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

Valve supervisory switch.
High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

Open circuits, shorts, and grounds in designated circuits.
Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
Loss of communication with any addressable sensor, input module, relay, control module, or remote annunciator.
Loss of primary power at fire-alarm control unit.
Ground or a single break in internal circuits of fire-alarm control unit.
Abnormal ac voltage at fire-alarm control unit.
Break in standby battery circuitry.
Failure of battery charging.
Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

Initiate notification appliances.
Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.

2.3 FIRE-ALARM CONTROL UNIT

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

Digital Monitoring Products.

GAMEWELL.

GE UTC Fire & Security; A United Technologies Company.

Siemens Industry, Inc.; Fire Safety Division.

SimplexGrinnell LP.

B. General Requirements for Fire-Alarm Control Unit:

Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

Annunciator and Display: Liquid-crystal type.
Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

Pathway Class Designations: NFPA 72, Class B.
Pathway Survivability: Level 0.

E. Notification-Appliance Circuit:

Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

F. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

G. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38.

Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
Station Reset: Key- or wrench-operated switch.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

Comply with UL 268; operating at 24-V dc, nominal.
Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:

Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

Primary status.

Device type.
Present average value.
Present sensitivity selected.
Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

Primary status.
Device type.
Present average value.
Present sensitivity selected.
Sensor range (normal, dirty, etc.).

Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
Each sensor shall have multiple levels of detection sensitivity.
Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

Temperature sensors shall test for and communicate the sensitivity range of the device.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature or a rate of rise.

Mounting: Twist-lock base interchangeable with smoke-detector bases.
Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.

Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464.

C. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

Mounting: Wall mounted unless otherwise indicated.
Flashing shall be in a temporal pattern, synchronized with other units.
Strobe Leads: Factory connected to screw terminals.
Mounting Faceplate: Factory finished, red.

2.8 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.9 ADDRESSABLE INTERFACE DEVICE

A. General:

Include address-setting means on the module.

Store an internal identifying code for control panel use to identify the module type.
Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal.

Allow the control panel to switch the relay contacts on command.
Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

Operate notification devices.
Operate solenoids for use in sprinkler service.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

Verification that both telephone lines are available.
Programming device.
LED display.
Manual test report function and manual transmission clear indication.
Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

Address of the alarm-initiating device.
Address of the supervisory signal.
Address of the trouble-initiating device.
Loss of ac supply.
Loss of power.
Low battery.
Abnormal test signal.
Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.

D. Manual Fire-Alarm Boxes:

Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
Mount manual fire-alarm box on a background of a contrasting color.
The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.

E. Smoke- or Heat-Detector Spacing: Comply with NFPA 72.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (9100 mm) long shall be supported at both ends.

G. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

H. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

I. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

J. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.

K. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 PATHWAYS

A. Pathways shall be installed in EMT.

B. Exposed EMT shall be painted red enamel.

C. J-Box covers shall be painted red.

3.3 CONNECTIONS

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (910 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

Smoke dampers in air ducts of designated HVAC duct systems.
Magnetically held-open doors.
Electronically locked doors and access gates.

Alarm-initiating connection to activate emergency lighting control.
Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
Supervisory connections at valve supervisory switches.
Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. J-box covers shall be painted red.

B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from building electrical system to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.6 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Perform the following tests and inspections:

Visual Inspection: Conduct visual inspection prior to testing.

Inspection shall be based on completed record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter.
Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

C. Fire-alarm system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

F. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 16720