Blue Ribbon Suites LLC
Building 29

Highland Avenue and 9th Street
Milwaukee, WI

Project Manual
Milwaukee Historic Preservation Commission Submission

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SECTION 011100
SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Description of construction delivered under multiple contracts.
   2. Restrictions that affect construction operations.
   3. Use of buildings, premises and site.

1.2 GENERAL SUMMARY OF WORK AND ADDITIONAL DEFINITIONS

A. Owner: Blue Ribbon Suites LLC

B. Project Location: Highland Avenue and 9th Street, Milwaukee, WI.

C. General Scope: Project consists of renovation of approximately 234,000 square feet in a 3-story existing building. Building will house approximately 440 students in residential suites and provide amenity spaces including a Food Court, Fitness Center and Classrooms, all as described within the scope of the Contract Documents. Historic preservation is to comply with guidelines from the National Park Service and Wisconsin Historical Society. .
   1. Work Included: Provide labor, materials, articles, equipment, incidentals, items, tools, services, supplies, methods, operations, skills in such quantities as may be necessary to complete Project within intent of Contract Documents.
   2. Singular notations shall be considered plural where plural application is reasonably inferable. Mention or indication of extent of work under work division or specification section is done only for convenience of Contractor and shall not be construed as describing all work required under that Division or Section.

D. Construction Contract: Construction will be accomplished under multiple Prime Contracts.

E. Construction Limits: Except as specifically indicated or as may be necessary to complete the Work under the Contract, activities of the Contract shall be limited to within the limits designated on Drawings.

1.3 SUBCONTRACTORS

A. Do not award work to Subcontractor without prior approval of Owner and Architect. Approval will not be given until Contractor submits List of Subcontractors containing such information as Owner, Architect and Construction Manager may require concerning the proposed Subcontractor and scope of subcontract. (Refer to Section 013300 – Submittal Proceddures).

1.4 USE BY OWNER

A. Owner reserves the right to let other contracts in connection with this Project or in connection with existing buildings. This Contractor must afford other contractors reasonable opportunity for the introduction and storage of their materials and execution of their work, and shall properly connect and coordinate the contractor's work with theirs.

B. Owner reserves the right to jointly occupy the premises with Contractor in performance of Owner's duties and functions. Owner also reserves the right to: enter into the Project and premises; make installations of materials and equipment at appropriate times as the Work progresses; install equipment, furniture and furnishings when spaces are at appropriate stages of completion. Coordinate work with Owner and cooperate with Owner to minimize undue interferences.

C. If any part, unit, phase, or the entire Project is substantially complete or ready for occupancy, Owner may, upon notice to Contractor, and without prejudice to rights of Owner or Contractors, enter into and make use of work that is substantially complete.

1.5 MAINTAINING SERVICES AND FUNCTIONS

A. General: It is essential that full Owner's services and functions are maintained throughout construction period, with minimum disturbance and disruption to Owner's operations. Contractor and Subcontractors shall be aware of these requirements and objectives. Contractor must conduct work and develop a detailed schedule to meet these requirements and objectives.

B. Work at Occupied Facilities: After Owner's occupancy (full or partial) of Project or unit, stage, phase or area, work remaining to be accomplished in the occupied spaces shall be done in cooperation with, and approval by, Owner and scheduled in advance with Owner. In general, work in occupied spaces shall be done when the space is not in use, such as after hours in administrative areas or public spaces when public use hours are over for the day, unless specifically approved by Owner. Where necessary, overtime shall be used if work cannot reasonably be accomplished during normal work periods, at no extra cost to Owner. Perform work in occupied areas in a manner and at such time as will not significantly interfere with, hamper or inconvenience Owner's program or functions.

1.6 PERFORMANCE/PAYMENT BOND

A. Owner reserves the right to require a bond in accordance with General Conditions and Supplementary Conditions. Provide on form specified.
   1. AIA A311.
   2. Provide and pay for bond.

1.7 OTHER BONDS, PERMITS, FEES

A. Provide and pay for bonds, fees and permits that may be required, including bonds, permits and fees required by municipalities, including connecting fees, to directly accomplish work under this project.

1.8 WARRANTIES

A. In the event of conflict, inconsistency, or difference between a warranty issued by a supplier or contractor and terms of specifications, Owner, if it becomes necessary to enforce terms and provisions of warranty or specifications, may elect to enforce either submitted warranty or specifications.

1.9 ELECTRONIC FILES

A. Upon request, one copy of electronic files in Architect’s current file format, including applicable layers, for each issue (bid packages, construction packages, addenda, etc.) will be provided via e-mail, CD, or website posting at Architect’s option to Contractor at no charge for:
   1. Architectural floor plans
   2. Reflected ceiling plans
   3. Structural framing plans
   4. HVAC plans
   5. Plumbing plans
   6. Lighting plans
   7. Signal/System plans
   8. Power plans.

B. Additional documents not listed or additional copies of electronic files are available upon request with advance payment of applicable fee(s) and subject to conditions of use. Contact Architect for schedules of fees and additional details about conditions. Subcontractors and others can obtain copies of electronic files from Contractor.

C. Electronic files and information therein are instruments of service and works in progress created for this Project and not to be used for other projects, additions to this project or completion of this Project by others.

D. Signed and sealed original hard copy Drawings, Specifications and other documents as defined by General Conditions are Contract Documents. Electronic files are not Contract Documents and may be subject to manipulation beyond Architect's control. Therefore, Architect cannot verify that electronic files accurately or completely reflect Contract Documents, actual construction or field conditions. Each user of electronic files must determine accuracy, completeness and suitability for its intended use.

E. Electronic files are subject to discrepancies as a result of numerous factors including but not limited to transmission and translation errors resulting from differences in software, hardware and other equipment related problems, disc or server malfunctions, data corruption during transmission through website or email and user error. Neither Architect nor Owner shall be responsible for such discrepancies.

F. Architect makes no representation regarding accuracy, completeness or permanence of electronic files. Changes to Contract Documents may not be incorporated into electronic files including without limitation, Addenda information or revisions made after date indicated on electronic files.

G. By accepting electronic files, user covenants not to sue, and agrees to indemnify and hold harmless Architect and Owner from costs (including attorneys' fees), claims or causes of action be it tort, breach of contract or otherwise that result from the use of electronic files, and waives claims for consequential and/or liquidated damages against Architect and Owner.

H. Architect and Owner provide no warranties, express or implied with respect to electronic files, including but not limited to, Spearin type warranties, warranties of merchantability and/or fitness for a particular purpose.

I. Use of electronic files provided by Architect does not obviate Contractor, subcontractor/installer or supplier from responsibility for proper checking and coordination of dimensions, details, member sizes, quantities and other requirements to facilitate complete and accurate fabrication, installation and completion of Work.

J. Providing electronic files by Architect is not to be construed to be in derogation of reserved or intellectual property rights.

1.10 COPIES OF DRAWINGS AND SPECIFICATIONS

A. Drawings and Specifications will be made available to Contractor via an electronic distribution service. Subcontractors obtain documents from Contractor. Subcontractors are responsible for costs associated with hard copy printing drawings from this service. Provide one set for the on-site set to record changes as Record Set.

1.11 USE OF PREMISES - SPECIAL CONSIDERATIONS, REQUIREMENTS AND CONSTRAINTS

A. Work Over Finished Floors: Where work is performed over finished floors (i.e. ceramic tile, concrete, VCT) or where area is used as a passage, provide hardboard or plywood cover to protect against damage or stains. Covering to be directed the Construction Manager.

B. Work Over Carpeting: Certain finishing operations may occur over installed carpet areas. Maintain carpet covering free from holes or gaps. At hard use areas, such as passages, also provide hardboard or plywood surfacing to prevent damage. Use extreme care in working over carpeting and its covering.

C. Safety Program: Develop a safety program and provide first aid kits in several accessible locations on site for temporary on-site first aid. Contractor is responsible for safety of persons and property and compliance with applicable statutes, rules, regulations, and orders for work under this Contract.

D. Temporary Plywood Enclosures, General: Supported, sound plywood of appearance acceptable to Architect. Insulate enclosures at building openings where temporary enclosure serves as building exterior wall.

E. Accomplish work in streets in conformance with Municipality requirements and to a schedule as Municipality may require. Contractor must make arrangements with Municipality.

F. Snow Removal: Remove snow from the building work areas, storage areas, and access routes after each period of snowfall to prevent the accumulation of snow and ice from impeding job progress or creating unsafe conditions.

1. Provide covered walkways at public sidewalks, fire exit as required to maintain public safety, and as may be required by the Municipality. (Refer to Section 006600 Special Conditions for further requirements).

1.12 USE OF PREMISES - BROKEN GLASS

A. Contractor is responsible for glass of the new building and glass in existing adjacent buildings in the vicinity of this Project. Provide protection for glass, except Subcontractors shall protect their own glass.

B. Near completion of Project, Contractor must replace broken, cracked, scratched or otherwise damaged or faulty glass, without additional reimbursement. Replace glass damaged by welding splatter. Cost of replacing glass broken or damaged by Subcontractors shall be paid for by party causing damage.

1.13 USE OF PREMISES - CLEAN CONDITIONS

A. References: Refer to General Conditions for general cleaning requirements, Section 017700 for Project Closeout Clean-up and Section 006600 Special Conditions for additional temporary closure requirements.

B. General: Contractor and subcontractors shall maintain clean conditions in areas of existing buildings and where new construction interfaces with existing buildings. Maintain areas free of accumulations of combustible materials. Provide good housekeeping and regular cleaning to maintain areas clean and free of debris. Provide proper closures between areas under construction including closures and measures to prevent spread of dust or other contamination.

1.14 HAZARDOUS SUBSTANCES AND HARMFUL PHYSICAL AGENTS

A. Where work of this project involves possible hazardous substances or harmful physical agents, exercise extreme care to avoid damage and preserve safety of personnel.

B. Regulations concerning availability of information and employee training in use and handling of "hazardous substances" and "harmful physical agents" are governed by Employee Right-to-Know Act of (1983 unless otherwise revised or updated; or amended by local jurisdictions).

C. Regulations governing handling of asbestos-containing materials and disposal of asbestos-containing debris are:

1. Code of Federal Regulations, Title 29, U.S. Department of Labor - Occupational Safety and Health Administration (OSHA), Section 1910.1001 - Asbestos.
2. Local pollution control agency Rules for Emission Standards for Asbestos.

1.15 GENERAL PROTECTION AND SAFETY

A. References: Refer to General Conditions of the Contract for general requirements.

B. General: In accordance with best construction practices, Contractor is solely and completely responsible for conditions of job site, including safety of persons and property affected directly or indirectly by contractor’s operations during performance of Work. This requirement shall apply continuously 24 hours per day until acceptance of Work by Owner and shall not be limited to normal working hours.

1.16 SAFETY DIRECTOR - FIRE AND ACCIDENT

A. Safety Director: Appoint a responsible employee to act as Safety Director (fire and accident or separate individuals for each) whose duty it shall be to prevent accidents and minimize fire hazards and to enforce safety precautions. Safety Director shall develop procedures and regulations to guide Contractor, subcontractors and workers. With particular respect to existing buildings, facilities, and Owner's staff, Safety Director shall consult with and be guided by directions of Owner.

B. Compliance: Contractor and Subcontractors shall conform to and abide by requirements of Safety Director.

C. Inspection: Safety Director shall periodically inspect spaces of work under this Contract and operations of Contractor and list hazards to be removed or corrected. These shall be reported to Owner, Contractor and responsible subcontractors, who shall promptly remove or correct hazards.

D. Site Meetings: Safety Director shall hold accident and fire prevention meetings at least once a month with representatives of various trades employed to insure employees understand and comply with programs.

1.17 FIRE SAFETY PRECAUTIONS

A. Reference: Refer to General Conditions for general requirements.

B. General: Contractor and Safety Director shall recognize the utmost importance of extraordinary precautions to prevent a fire in or adjacent to functioning and occupied building. Contractor, subcontractors and workers shall exercise extreme care to maintain and exercise fire safety precautions through work. This shall include providing sufficient fire fighting devices, watchmen, standby helpers or other precautions during construction, in use of temporary heat, welding, bracing, sweating, testing or other phases of work. Refer to Section 006600 Special Conditions for temporary fire fighting devices to be provided under Contract.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 011419
USE OF SITE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Use of site
   2. Site management and requirements.
   3. Work hours.

B. Related Sections:
   1. Refer to Sections 011100, 013100, 013216, and 015200 for special requirements, constraints, timing of work, scheduling of work, hazardous material protection, enclosures and similar requirements relating to this Section.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 SITE MANAGEMENT AND REQUIREMENTS

A. General: Upon commencement of Work at site, Contractor assumes site management at areas within construction limits, other areas where work is to be performed and adjacent storage areas, to provide proper direction to subcontractors and workers.
   1. Coordinate site management with Owner and Construction Manager and include maintaining areas as specified and required to be free of construction activity, parking and storage where it is necessary to provide clear access and areas for Owner's functions.

B. Responsibilities:
   1. Site management and maintenance shall include, but not be limited to:
      a. Enforcement of access, parking, delivery, storage, noise and other restrictions;
      b. Maintenance of fences in good condition; providing and maintaining site and safety lighting;
      c. Providing and maintaining temporary facilities as specified;
      d. Dewatering excavations, except water in trenches and excavations made by subcontractors solely for their own work;
      e. Protection of adjacent structures which could be damaged by water; overall fire and safety management; protection for site features to remain;
      f. Temporary partitions, closures, dust barriers and similar to separate work areas in existing building from other occupied areas, as well as between new additions and existing building spaces;
      g. Similar overall or general management of the site and adjacent public and other property to fulfill the obligations of this Contract.

C. Fencing: Refer to Section 006600 Special Conditions for fencing to be provided at areas of construction and storage.

D. Use of Streets: Where conduct of work requires obstruction or use of public street, it shall be responsibility of Contractor to secure necessary permits from Department of Public Works as detailed in Section 006600 Special Conditions.

E. Be responsible for protection of public in vicinity of work; nothing in these specifications shall be construed to relieve that responsibility.
   1. Protective devices shall conform to requirements of State Highway Department and proper public authorities and shall be installed as required by Department of Public Works.

F. Coordinate use of premises under direction of the Construction Manager.

G. Limits of Work: Confine operations to general areas for work as shown on Drawings. Work within limits approved in writing by the Construction Manager when necessary to work outside general areas in order to comply with Contract Documents.

H. Noise: Keep noise to minimum by use of adequate mufflers and other appropriate means. Limit A-weighted noise levels to 80 dBA when measured at a distance of 100 feet. Noise in excess of these limits shall be approved by the Construction Manager.

3.2 WORK HOURS

A. Working Hours: Work done outside of normal work hours, 7:00 am to 7:00pm on holidays or weekends shall be authorized in writing by the Construction Manager.

B. Contract Work: Perform work outside of normal hours as a planned single unit of work, during staged shifts of work or during split shifts of work. This work shall be a basic part of construction contract. Contract cost shall not be increased because of work outside normal work hours.

3.3 SITE STORAGE

A. General: Restricted site provides very limited area for storage, offices, sheds and operations, and shall be taken into consideration by Contractor and subcontractors in scheduling their work and their deliveries. Refer to Section 006600 Special Conditions for staging information.

B. Obtain and pay for use of additional storage or work areas needed for operations under this Contract, if required.

C. All parties shall cooperate and coordinate to use available areas most effectively and be concerned with sequences of work of Contract, which will best benefit overall job progress.

1. Establish and govern use of available space, with consideration to needs of subcontractors to work effectively on site.

D. Storage Areas: As determined by the Construction Manager.

3.4 CONDITION AND CARE OF SITE

A. General: Confine apparatus, materials, equipment, sheds and operations of workers at site to construction limits indicated on Drawings, or otherwise imposed by law or ordinance, and other adjacent areas permitted for storage.

B. Site and Project shall not be unreasonably encumbered with materials and equipment. Stockpile neatly and orderly and maintain other operations; regularly remove debris from the site.

1. Protect and restore features on or about site.
2. Owner and Architect may caution Contractor about conditions which they observe, but shall not be held responsible to provide such advice or for enforcing protection.

C. Site Protection: Protect existing trees and other plantings not to be removed and features of adjacent buildings, paved surfaces which are to remain and are susceptible to damage from ordinary operations of Contractor, trucking, or other activity.

D. Access: Maintain fire protection and access. Permit immediate access by fire fighting equipment.

E. Hazardous Protection: Warning signals, barricades and other protective measures for hazard shall be in place and operate 24 hours per day.

3.5 EXISTING UTILITIES AND SERVICES

A. General: Exercise care to prevent interruption of existing services. Protect from damage utilities or other services which are shown, or not shown but encountered or otherwise found, from excavation or other work and operations of this Contract, unless or until they are abandoned..

1. If the utilities or services are not abandoned, or to be abandoned, immediately restore damage from work or operations to place utilities and service in an equal or better condition than that which existed.

2. Where utilities or services are shown to be abandoned or moved, they shall remain in service, and be protected by Contractor, until new utilities and services have been provided, tested and are ready for use. Lines or mains of utility companies or Municipality shall be replaced or repaired as directed by them.

B. Unknown Utilities: In the event unknown mains or lines are uncovered, stop work in that area and notify the utility company, Architect and Construction Manager to obtain information on how to proceed.

END OF SECTION

SECTION 013591
HISTORIC TREATMENT PROCEDURES

Revised BP-1, Addendum No. 1, August 12, 2014

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents as defined by the conditions of the Contract shall apply to this Section.

1.2 SCOPE

A. Section includes general protection and treatment procedures for the entire Project and the following specific work:
   1. Historic removal and dismantling of:
      a. Removal, labeling and secure storage of building accessories (ladders, signage, window security screens, etc.).
      b. Brick walls and mortar joints.
      c. Limestone windowsills and watertable.
      d. Limestone and brick parapet.

   2. Replication of:
      a. Brick walls and historic lime mortar.
      b. Limestone and brick parapet.
      c. Redressing limestone surfaces insitu.

B. Related Requirements:
   1. Section 040120 "Maintenance of Historic Masonry" for specific requirements for reconstructing, cleaning, and repairing brick and stone masonry units.

1.3 DEFINITIONS

A. Consolidate: To strengthen loose or deteriorated materials in place.

B. Construction Laborer and Helpers: Individuals that assist in the general construction activities at the project site as defined by the Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2012-13 Edition, Construction Laborers and Helpers. Source: http://www.bls.gov/ooh/construction-and-extraction/construction-laborers-and-helpers.htm
   1. Construction Laborer and Helper personnel must remain within the defined parameters of their job description for this project as defined by the Bureau of Labor Statistics, U.S. Department of Labor. Thus, these individuals are not permitted to engage in direct labor activities that involve the use of skill-trade tools that come in contact with historic masonry materials on this project.

C. Deconstruction: To disassemble, dismantle and carefully remove and detach items by hand from existing construction to the limits indicated, using small hand tools and small one-hand power tools, so as to protect nearby historic surfaces; and legally dispose of waste/debris off-site, unless items are identified to be harvested for reuse.

D. Existing Condition to Remain: Treatment not required.

E. Harvest: To protect removed or dismantled items from damage during deconstruction to include the hoisting and transportation to the on-site inventory staging area and prepare items for reuse.

F. Historic: Spaces, areas, rooms, surfaces, materials, finishes, and overall appearance which are important to the successful preservation, rehabilitation, restoration and reconstruction as determined by the Masonry Preservation Consultant, and the Architect.

G. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.

H. Redress Insitu: To scale off all loose pieces of original stone from masonry intended to stay in place, including surface materials in powder or granular form and detachment of planar elements, spalls, and chips. Masonry contractor shall sound faces to determine delaminated pieces that may not be immediately visible.

I. Reconstruct: To remove existing item, replicate damaged or missing components, and reinstall in original position.

J. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

K. Return and Reinstall: To protect removed or dismantled item, repair and clean it as indicated for re-use, and reinstall it in original position, or where indicated.

L. Remove: Specifically for historic spaces, areas, rooms, and surfaces, the term means to detach an item from existing construction to the limits indicated, using hand tools and hand-operated power equipment, and legally dispose of it off-site, unless indicated to be salvaged or reinstalled.

M. Repair: To correct damage and defects, retaining existing materials, features, and finishes while employing as little new material as possible. Includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

N. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

O. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

P. Reproduce: To fabricate a new item, accurate in detail to the original, and in either the same or a similar material as the original, unless otherwise indicated.

Q. Restore: To consolidate, replicate, reproduce, repair, and refinish as required achieving the indicated results.

R. Retain: To keep existing items that are not to be removed or dismantled.

S. Reversible: New construction work, treatments, or processes that can be removed or undone in the future without damaging historic materials unless otherwise indicated.

T. Skill-Trade Restoration Worker: This occupation title is for the purpose of worker identification in relation to the Masonry Treatment Requirements (MTR) for this project. Individuals that have satisfied the education and qualifications required (in the restoration industry/union/trade school/ or degree program) to attain a skill-trade position/title as defined by the Bureau of Labor Statistics, U.S. Department of Labor, Occupation Outlook Handbook, 2012-13 Edition, Brickmasons, Blockmasons, and Stonemasons. Source: http://www.bls.gov/ooh/construction-and-extraction/brickmasons-blockmasons-and-stonemasons.htm

U. Stabilize: To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.

V. Strip: To remove existing finish down to base material unless otherwise indicated.

W. Supervisor: This occupation title is for the purpose of worker identification in relation to the Masonry Treatment Requirements (MTR) for this project. Individuals that are responsible for the over-sight and supervision of skill-trade restoration workers engaged in the direct activities to deliver Masonry Treatment Requirements (MTR) for this project. Individuals may include, but are not limited to: project architect, intern architect, owner's representative, owner project manager, general contractor's superintendent, construction manager, estimator, project superintendent, masonry foreman, subcontractor's project manager, and masonry superintendent as defined by the Dictionary of Occupational Titles for 11-9021.00 – Construction Managers; O*NET OnLine. Source: http://www.onetonline.org/link/summary/11-9021.00

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during removal and dismantling work are to remain Owner's property. Carefully dismantle and salvage each item or object.

B. Coordinate with Owner's Masonry Preservationist, who will confirm or establish special procedures for dismantling and harvesting of Masonry for reuse, and the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Provide Documentation on activity to be performed in historic spaces, areas, and rooms, and on historic surfaces:
   1. Indicate all activities requiring Historical treatment, with starting and ending dates.

B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and previous repairs, including any brick or limestone finish surface damage that might be misconstrued as damage caused by Contractor's masonry treatment operations.

C. On-site Training Program Participants: Provide the names and trade position titles of each skill-trade restoration worker that will be assigned to participate in the on-site training program prior to scheduling the date of the individual (MTR) training session.
   1. NOTE: “The Cost of the Trainer (Historic Masonry Preservation Consultant) and their time is provided by the owner; however, the time of masons and supervisors along with materials required to complete the training is to be included in the scope of the restoration bid. The Training Sessions include up to eight (8) masons and two (2) supervisors in the training sessions for each MTR. If the restoration contractor requires additional masons to be trained in additional sessions – either because of attrition or staffing decisions, the restoration contractor is responsible for the cost of any additional training sessions that must be scheduled above the original up to 8 masons and 2 supervisors.” ***(ADD-1)***

D. Inventory of Harvested Items: After removal or dismantling work is complete, submit a list of harvested items and the on-site staging location.

E. Mockups: Prepare mockups of specific historic treatment procedures specified in this Section to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Typical Removal Work:
      a. Damaged brick, full replacement locations
      b. Deteriorated mortar joints (original lime mortar)
      c. Cement-based mortar joints (non-original mortar)
      d. Damaged stone, Dutchman locations and spalls.
      e. Full stone replacement locations.
   2. Typical Dismantling Work:
      a. Existing parapet masonry, brick and stone to be removed, reset and re-laid, brick to be harvested, stone to be harvested.

F. Storage of Harvested Stone: Before harvested stone is removed from the building, submit harvested stone deconstruction, cleaning, receiving, storage and handling plan. Include storage locations, sequencing and information showing compliance with Indiana Limestone Institute of America Contractor’s Handbook.

G. Storage of Harvested Brick: Before harvested brick is removed from the building submit harvested brick deconstruction, cleaning, receiving, storage, and handling plan. Include storage locations, and sequencing of operations.

H. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

I. Standards: Comply with Indiana Limestone Institute of America, ASTM E2659-09 Historic Masonry Training Components, and the Secretary of the Interior's Standards for Rehabilitation.

1.6 STORAGE AND PROTECTION OF HISTORIC MATERIALS

A. Harvested Historic Materials:
   1. Clean existing mortar and debris from harvested historic items. Use tools and methods to prevent damage to historic items.
   2. Palletize or crate items to be harvested; cushion against damage during handling and cleaning.
   3. Do not place harvested items directly on the ground.

4. Use adequate sized staging materials; i.e., shoring boards, planks, and pallets that will support the weight of the item without collapse.
5. Store items in a secure area on-site until ready for reuse.
6. Transport items to secure area without causing damage.
7. Label all harvested items according to the project requirements and under the direction of the architect. The use of permanent markers or painter's tape will not be permitted.

B. Historic Materials for Reinstallation:
1. Repair and clean historic items as indicated and to functional condition for reuse.
2. Protect items after cleaning and repairing; cushion against damage during cleaning, repairing and handling.
3. Re-label harvested items after cleaning and repairing if required.
4. Protect items from damage during cleaning, repairing, transport, and storage.
5. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make item functional for use indicated.
6. Comply with Indiana Limestone Institute of America standards for storing stone. A-frames are required for storage of stones.

C. Existing Historic Materials to Remain: Protect historic materials indicated to remain against damage and soiling from construction work. This includes but is not limited to: existing limestone steps, brick steps, concrete walks, column brick pier bases, doors, sills, and projecting exterior brick and stone features. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after historic treatment and construction work in the vicinity is complete.

D. Storage and Protection: When taken from their existing locations, catalog and store historic items within a weathertight enclosure where they are protected from wetting by rain, snow, condensation, or ground water, and from freezing temperatures.
1. Identify each item with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft and vandalism.
3. Comply with Indiana Limestone Institute of America standards for storing stone. A-frames are required for storage of stones.
4. Document and record the location of original brick units harvested for reuse. Reuse the harvested brick units in the same location from where they were obtained during deconstruction operations.

1.7 PROJECT CONDITIONS

A. General Size Limitation in Historic Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

B. Owner will maintain conditions existing at time of inspection for bidding purpose as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

D. Hazardous Materials: Hazardous materials are present in construction affected by removal and dismantling work. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
1. Hazardous material remediation shall take place prior to dismantling or selective demolition.
2. If unanticipated asbestos is suspected, stop work in the area of potential hazard, shut off fans and other airhandlers ventilating the area, and rope off area until the questionable material is identified. Re-assign workers to continue work in unaffected areas. Resume work in the area of concern after safe working conditions are verified.

E. Storage or sale of removed or dismantled items on-site is not permitted unless otherwise indicated.

F. All historic removed or dismantled items harvested for reuse shall remain on-site unless otherwise indicated.

PART 2 PRODUCTS

2.1 SCAFFOLDING SYSTEM *(ADD-1)*

A. Bidder is responsible for compliance with the requirements of the Contract Documents by whatever scaffolding “means and methods” are planned to be used. Scaffolding method should provide access to periodic reviews of the work by the architect and or owner and must comply with all applicable codes and safety requirements.

~~B. The use of leg and brace type scaffolding with walkway decking consisting of over-lapping wood planking is not permitted.~~

~~C. The use of hydro-mobile type scaffolding is not permitted.~~

~~D. The use of man-lifts to execute the masonry treatment requirements is not permitted.~~

~~E. The use of pipe style scaffolding with aluminum cleat deck planking is permitted.~~

PART 3 EXECUTION

3.1 SELECTIVE DECONSTRUCTION AND MATERIAL HARVESTING SPECIALISTS

A. Selective Deconstruction and Material Harvesting shall be governed by the requirements as defined in this Section, 040120 Maintenance of Historic Masonry and the Architect.

B. Only skill-trade restoration workers (as defined in 1.03 DEFINITIONS, page 2) that have successfully completed the ASTM E2659-09 Historic Masonry Training Component: MTR-1 Selective Deconstruction and Material Harvesting, will be permitted to execute the work scope defined in this Section.

C. Each skill-trade restoration worker engaged in the execution of the work of this Section shall earn and receive a training certificate and hardhat decal. Training certificates shall remain in the construction field office and are available upon Architect or Owner request.

D. Construction laborers (as defined in 1.03 DEFINITIONS, page 1) are not permitted to earn ASTM E2659-09 Historic Masonry training certificates.

1. Construction laborers and helpers can assist restoration workers in organizing and collecting the necessary materials, equipment, supplies, and tools to complete Masonry Treatment Requirements (MTR).
2. Construction laborers and helpers are not permitted to engage in the direct activity of Masonry Treatment Requirement (MTR) work on the building or on harvested material for reuse.

3.2 EXAMINATION

A. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures will be necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.

1. Verify that affected utilities have been disconnected and capped.
2. Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage.
3. Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
4. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures as a result of removal and dismantling work.

B. Survey of Existing Conditions: Record existing conditions by use of mark-ups on measured drawings and preconstruction photographs.

1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."

C. Perform regular scheduled surveys as the Work progresses to detect hazards resulting from masonry treatment procedures. Document any changes in work scope that is in conflict with the construction documents.

3.3 PROTECTION, GENERAL

A. Ensure that MTR trained supervisory personnel are on-site and on duty when historic treatment work begins and during its progress.

B. Protect persons, motor vehicles, surrounding surfaces of building; building site, plants, and surrounding buildings from harm resulting from historic treatment procedures.
   1. Use only proven protection methods, appropriate to each area and surface being protected.
   2. Provide barricades, barriers, and temporary directional signage to exclude public from areas where historic treatment work is being performed.
   3. Erect temporary protective covers over walkways, steps, doors and at points of pedestrian and vehicular entrance and exit that must remain in service during course of historic treatment work.
   4. Contain dust and debris generated by removal and dismantling work and prevent it from reaching the public or adjacent surfaces.
   5. Provide shoring, bracing, and supports as necessary. Do not overload roof or other structural elements.
   6. Protect floors and other surfaces along haul routes from damage, wear, and staining.
   7. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.

C. Temporary Protection of Historic Materials:
   1. Protect existing historic materials with temporary protections and construction. Do not deface or remove existing materials.
   2. Do not attach temporary protection to historic surfaces except as indicated as part of the historic treatment program and approved by Architect.

D. Comply with each product manufacturers' written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, vegetation, historic landscape, trees, and underground systems.

E. Utility and Communications Services:
   1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by the historic treatment work before commencing operations.
   2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for the historic treatment work.
   3. Maintain existing services unless otherwise indicated; keep in service and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

F. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is in working order.
   1. Prevent solids such as stone, brick, or mortar residue from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from historic treatment work.
   2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

G. Existing Roofing: Prior to the start of work in an area, install roofing protection.

3.4 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm or damage resulting from applications of chemical cleaners and paint removers.

B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in historic

treatment program. Use covering materials and masking agents that are waterproof, UV resistant, and will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturers' written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces.

C. Do not apply chemicals during winds of sufficient force to prevent spreading to unprotected surfaces.

D. Neutralize and collect alkaline and acid wastes and legally dispose of off Owner's property. Comply with all City of Milwaukee MMSP requirements and regulation.

E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.5 PROTECTION FROM FIRE

A. General: Follow fire-prevention plan and the following.
   1. Comply with NFPA 241 requirements unless otherwise indicated.
   2. Remove and keep area free of combustibles including, rubbish, paper, waste, and chemicals, except to the degree necessary for the immediate work.
      a. If combustible material cannot be removed, provide fire blankets to cover such materials.
   3. Prohibit smoking by all persons within Project work and staging areas.

B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or highly combustible materials, including welding, torch-cutting, soldering, brazing, paint removal with heat, or other operations where open flames or implements utilizing high heat or combustible solvents and chemicals are anticipated:
   1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
   2. As far as practical, restrict heat-generating equipment to shop areas or outside the building.
   3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
   4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
   5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
   6. Fire Watch: Before working with heat-generating equipment or highly combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows.
      a. Train each fire watch in the proper operation of fire-control equipment and alarms.
      b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
      c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.

C. Fire Extinguishers, Fire Blankets, and Rag Buckets: Maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags soiled with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire watch are trained in fire extinguisher and blanket operation.

D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
   1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is completed.

3.6 GENERAL HISTORIC TREATMENT

A. Ensure that MTR trained supervisory personnel are present when historic treatment work begins and during its progress.

B. Halt the process of deterioration and stabilize conditions unless otherwise indicated. Perform work as indicated on Drawings and in Section 04 01 20 Maintenance of Historic Masonry. Follow the procedures in subparagraphs below and procedures approved in historic treatment program:

1. Retain as much existing material as possible; repair and consolidate rather than replace.
2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
3. Use reversible processes wherever possible.
4. Use historically accurate repair and replacement materials and techniques and as defined and established during the ASTM E2659-09 Historic Masonry Training Program specific to this project unless otherwise indicated.
5. Record existing work before each procedure (preconstruction) and progress during the work with digital preconstruction documentation photographs. Comply with requirements in Section 01 32 33 "Photographic Documentation" and with Masonry Treatment Requirements (MTR) on drawing sheets AP1-NC1 and AP1-NC2.

C. Notify Architect of visible changes in the integrity of material or components whether due to environmental causes including biological attack, UV degradation, freezing, or thawing; or due to structural defects including cracks, movement, distortion, or the execution of the Work specified.

1. Do not proceed with the work in question until directed by Architect.

D. Where missing features are indicated to be repaired or replaced, provide features whose designs are based on accurate duplications rather than on conjectural designs, subject to approval of Architect.

E. Where Work requires existing features to be removed or dismantled and reinstalled, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.

1. Contractor will be responsible for repair or replacement of damaged material as directed by the Architect at no additional labor or material cost to the Owner.

F. Identify new and replacement materials and features with permanent marks hidden in the completed work to distinguish them from original materials. Record a legend of identification marks and the locations of the items on as-built Drawings.

3.7 HISTORIC REMOVAL, DECONSTRUCTION AND MATERIAL HARVESTING

A. General: Have removal and dismantling work performed by skill-trade restoration workers that are project trained on-site and have earned a MTR 1 Deconstruction and Material Harvesting Certificate. Construction laborers shall not perform removal and dismantling work. Ensure that MTR project trained field supervisors are present when removal and dismantling work begins and during its progress.

B. Perform work according to the historic treatment approach to comply with the approved deconstruction sequencing procedures identified in the ASTM E2659-09 Historic Masonry Training Program.

1. Provide supports or reinforcement for existing construction that becomes temporarily weakened by the work, until the work is completed.
2. Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required, with minimum disturbance of adjacent work.
3. Do not operate air compressors inside building, unless approved by Architect in each case.
4. Do not drill or cut columns, beams, joints, girders, structural slabs, or other structural supporting elements, without having Contractor's professional engineer's written approval for each location before such work is begun.
5. Do not use explosives.
6. Do not use construction laborers to perform this work.

C. Water-Mist Sprinkling: Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.

D. Unacceptable Equipment: Keep equipment that is not permitted for historic removal or dismantling work away from the vicinity where such work is being performed.

E. Removing and Dismantling Items on or near Historic Surfaces:
   1. Use only approved dismantling tools and procedures established during the ASTM E2659-09 Historic Masonry Training Program. Protect historic surface from contact with or damage by tools.
   2. Unfasten items to be removed, in the opposite order from which they were installed.
   3. Support each item as it becomes loosened to prevent stress and damage to the historic surface.
   4. Dismantle anchorages.

F. Masonry Walls:
   1. Remove masonry carefully and erect temporary bracing and supports as needed to prevent collapse of materials being removed.
   2. Dismantle top edge and sides before removing wall or parapet. Stop removal work and immediately inform Architect if any structural elements above or adjacent to the work show signs of distress or dislocation during any phase of removal work.
   3. Remove wall or parapet in easily managed pieces.
   4. During removal, Contractor is responsible for the stability of the partially remaining wall. Notify Architect of the condition of temporary bracing for wall if work is temporarily stopped during the wall's removal.
   5. The use of construction laborers is not permitted in the dismantling and deconstruction process.

G. Steelwork:
   1. Expose structural steel for examination by Architect before proceeding with removal or dismantling.
   2. If distress in structure is apparent during performance of the work, stop removal or dismantling and take immediate precautionary measures to ensure safety of the structure. Inform Architect of the problem, steps taken, and proposed corrective actions.
   3. Brace and support structural steel being removed and remaining during removal and dismantling.
   4. Concrete-Encased Steel: Where steel is known to be encased by concrete being removed, saw cut with blades that will cut no deeper than the thickness of the concrete cover with an adequate margin for error in the location of the steel. Isolate sections of concrete by saw cutting before beginning removal.

H. Loose Plaster: Identify loose, non-historic plaster and separate it from its substrate by tapping with a hammer and prying with a chisel or screwdriver. Do not use pry bars. Leave sound, firmly adhered plaster in place. Do not damage, remove, or dismantle historic plasterwork except where indicated or where it is an immediate hazard to personnel and as approved by Architect.

I. Concrete Floor Surface Removal: Remove floor surfaces, fill, and topping, to the indicated lower elevations or cleavage planes as indicated on Drawings. Use dismantling methods when removing floor surfaces 12 inches (300 mm) or less away from historic walls to remain. Remove material to a uniform surface at the indicated level.

J. Anchorages:
   1. Remove anchorages associated with removed items.
   2. Dismantle anchorages associated with dismantled items.
   3. In non-historic surfaces, patch holes created by anchorage removal or dismantling according to the requirements for new work.
   4. In historic surfaces, patch or repair holes created by anchorage removal or dismantling according to Section specific to the historic surface being patched.

END OF SECTION

SECTION 014200
REFERENCES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Reference to standards and codes.

B. Related Sections:
   1. Section 006600 – Special Conditions.
   2. Section 013501 – Historic Treatment Proceedures.
   3. Section 016210 - Product Options and Substitution Requirements.

1.2 DEFINITIONS

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

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

C. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.

D. "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.

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

F. "Install": The term "install" describes operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

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

H. "Installer": An installer is the Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

I. The term "experienced," when used with an entity, means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

J. Using a term 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 trades people of the corresponding generic name.

K. "Project site" is the space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 APPLICABLE GOVERNING STANDARDS

A. Code Overview: Code plans identifying Occupancy Types, Occupant Loads, Construction Type and Exiting Components should be consulted for additional information.

1. Applicable State Building Code: (refer to drawings)
   a. State Building Code which adopts by reference the 2009 International Building Code.
2. Fire Code:
   a. State Fire Code with reference to U.L. Fire Resistance Index.
3. Mechanical Code:
   a. State Mechanical Code, latest edition.
4. Energy Code:
   a. State Energy Code, latest edition.
5. Plumbing Code:
   a. State Plumbing Code, latest edition.
6. Electrical Code:
   a. National Electrical Code (NEC), latest edition.
7. Elevator Code:
   a. State Building Code which adopts by reference and amends the American National Safety Code for Elevators and Escalators adopted by the American National Standards Institute and the American Society of Mechanical Engineers, ASME A17.1-2004 with addenda and supplement, A17.3-2002, A17.5-2004, A18.1-2005, A90.1-2003 and B20.1-2003.
8. Accessibility Code:
   a. State Building Code. ADA guidelines are used where these are more stringent and not in conflict with code requirements.
9. Life Safety Code:
   a. NFPA Life Safety Code 101 - 2000 edition, is consulted when building code is silent on an issue.
10. City of Milwaukee and MMSD Codes and Regulations.
11. Project is a registered Historic Building and the Owner is seeking Historic Tax Credits. All work to meet City of Milwaukee Preservation Requirements and National Park Service Requirements and Procedures.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Unless 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 standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two 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 uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
   1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. 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 requirements. Refer uncertainties to Architect for a decision before proceeding.
   2. If Contractor knowingly performs Work contrary to such laws, ordinances, rules and regulations without notice to Architect, consequent costs and damages will be paid by Contractor.

D. Copies of Standards: Each entity engaged in construction on Project must 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, obtain copies directly from publication source and make them available on request.

E. Certificate: For products specified in accordance with a Federal Specification, ASTM Standard, American National Standards Institute or similar association standards, upon request by Architect, the Contractor must provide an acceptable affidavit by independent testing laboratory, or other source approved by the Architect, certifying that product furnished for this Project complies with the particular standard specifications.

1. Where necessary, requested or specified, supporting test data shall be submitted to substantiate compliance. The manufacturer is subject to Architect's acceptance.

F. Abbreviations and Acronyms for Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

END OF SECTION

SECTION 014500
QUALITY CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Procedures to measure and report the quality and performance of construction.

B. Related Sections:
   1. Refer to the General Conditions for general requirements, and technical specifications for specific testing requirements and methods.
   2. Section 013300 - Submittal Procedures.
   3. Section 014533 – Structural Testing and Special Inspections.

1.2 REFERENCES

A. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ASTM E329 – Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

1.3 QUALIFICATIONS OF TESTING AGENCY

A. "Approved independent testing laboratory" shall mean an independent testing agency acceptable to the Owner and the Architect and possessing the professional qualifications and equipment to perform the specified tests and to evaluate and report the results.

1.4 QUALITY ASSURANCE

A. Comply with requirements of ASTM E329 and ASTM D3740.

B. Laboratory shall maintain a full-time registered Engineer on staff to review services.

C. Laboratory authorized to operate in State in which Project is located.

D. Testing equipment shall be calibrated at reasonable intervals with devices of an accuracy traceable to either NBS Standards or accepted values of natural physical constants.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 TESTING AND SPECIAL TESTING

A. Unless otherwise provided in the specifications, provide all materials, samples, mock-ups or assemblies for all tests specified in various sections of specifications, or as directed by the Architect, and pay shipping costs of such samples to laboratory or other testing location and facility.
   1. Unless specified otherwise, all tests shall be made by an approved independent testing laboratory and reports provided to Architect.

B. Tests shall be provided and accomplished in accordance with the standard used as the reference for the particular material or product, unless other test methods or criteria are specified.

C. In the absence of a referenced standard, tests shall be accomplished in accordance with applicable ASTM Standards or Test Methods, current at the date of the Contract Documents.

3.2 PAYMENT FOR TESTS

A. Unless otherwise indicated, the cost of tests shall be paid by the Contractor.

3.3 PAYMENT FOR TESTS

A. Except for the types of tests specified as being paid for by the Owner, the cost of other tests shall be paid by the Construction Manager/Contractor. Tests to be paid for by the Owner will be paid directly to the testing laboratory by the Owner.

B. The Owner will not pay for tests to determine if a proposed material will initially meet the specified requirements, which will include but not be limited to, analysis of paving aggregate, paving mix designs, and similar tests.

C. In general, it is intended the Owner will pay for those field tests to determine the quality of materials and quality of installation at site. The following is the list of the type of tests the Owner will pay for, where tests are specified or later determined as necessary:

- concrete compressive strength
- concrete air entrainment
- soil compaction
- structural steel field welds
- structural steel bolting
- welding or brazing of piping
- paving samples
- unit masonry sampled from site
- mortar samples
- fireproofing samples
- waterproofing/roofing samples

3.4 TESTS TO DEMONSTRATE QUALIFICATION

A. In addition to tests specified, should the Contractor propose a product, material, method or assembly that is of unknown or questionable quality to the Architect, the Architect may require and order suitable tests to establish a basis for acceptance or rejection.

1. Such tests will be paid for by the Contractor, or by the Subcontractor requesting approval. "Standard" test reports on "similar" material will not be acceptable.

B. The Owner and Architect reserve the right to require certification or other proof that the material, assembly, equipment, system or other product furnished or proposed to be furnished, for this Project is in compliance with any test or standard called for.

1. The certificate shall be signed by a representative of the independent testing laboratory.

C. Any tests required to qualify the Contractor or any workmen for any phase of the work, and any test of a method, system or equipment that may be required by specification or law to qualify the item for use, shall be made or taken without additional reimbursement.

D. If exploratory work is required to determine the cause of defects, the cost of such work shall be borne by the Contractor responsible for such work if the work is found, in the judgement of the Architect to be defective.

1. If the Contractor responsible for the work is adjudged by the Architect to be not at fault, exploratory testing will be paid by the Owner.

3.5 INSPECTIONS

A. Should the specifications, Architect's instruction, laws, ordinances or any public authority require any work to be inspected or approved, give timely notice of its readiness for inspection and a reasonable date fixed for such inspection. If any work requiring inspection should be covered up without approval or consent of the approving agency, it must be uncovered for examination at Contractor's expense.

3.6 CERTIFICATES

A. Except for test reports provided and signed by approved independent testing laboratories, all certificates required by the specification shall be signed by an authorized official of the firm providing the certificate, with the signature notarized, when such certificates by the producer are acceptable to the Architect.

3.7 RETEST RESPONSIBILITY

A. Where results of required inspections, tests or similar prove unsatisfactory and do not indicate compliance of related work with requirements of the contract documents, then retests are responsibility of Contractor, regardless of whether original test was Contractor's responsibility.

B. Retesting of work revised or replaced by Contractor is Contractor's responsibility, where required tests were performed on original work.

END OF SECTION

SECTION 040120
MAINTENANCE OF HISTORIC MASONRY

Revised BP-1, Addendum No. 1, August 14, 2014

1.1 RELATED DOCUMENTS

A. All of the contract documents as defined by the conditions of the contract shall apply to this Section.

1.2 DESCRIPTION

A. The Pabst Brewing Company Bottling Department Building (also known as Building No. 29) is a historically significant building constructed in 1891 to 1911 and is located in Milwaukee, Wisconsin at the corner of 9th Street and Highland Avenue. The building was designed in the Gothic Style to impart an "Old World" character through the extensive use of castellated parapets, embattlements, and corbelling within the façade detailing. The building features Milwaukee crème-city common brick, limestone windowsills and ashlar-cut rock-faced stone foundation on the east elevation. The building also incorporates stone water tables and tracery set in pure lime mortar. The historic brickwork details include: running bond jack arches and running bond corbelled eyebrow arches over the windows. The exterior walls are laid in a five-course stretcher header bond pattern. The building was placed on the National Register of Historic Places in 2003.

B. In addition to all other requirements, all work of this Section shall be performed under the guidelines of the Secretary of the Interior's Standards for the Treatment of Historic Properties and must comply with the Secretary of the Interior's Standards for Rehabilitation.

C. Section includes maintenance of historic masonry consisting of brick and stone repair, reconstruction, repair, rehabilitation, restoration, and preservation as follows:
   1. Mortar joint removal of original and non-original mortar.
   2. Deconstruction of parapet walls – harvest historic brick and stone for reuse.
   3. Rebuild parapet walls to original design, layout, corbelling, and bond pattern.
   4. Unused anchor removal.
   5. Stone crack injection with DHL repair material.
   6. Repoint mortar joints with lime putty mortar.
   7. Flashing installation: stainless steel, membrane, and lead t-caps.
   8. Removal of stone, redress and return to the same location.
   9. Redress stone insitu.
   10. Remove and replace stone.
   11. Stone patching with substitute stone material.
   12. Dutchman stone repair.

D. Intent of this Section is:
   1. To preserve as much of the original historic material as possible.
   2. To repair, rebuild or reconstruct all deteriorated historic brick, stone, and mortar joints.
   3. To ensure that all repair and replacement materials will match remaining historic construction in all physical and visual aspects, including material, form, color, texture, and workmanship.
   4. To ensure that all work will be done using the gentlest methods available.
   5. To ensure that sound historical materials will not be put at risk due to the work of this Section.

1.3 DEFINITIONS

A. ASTM E2659-09 Historic Masonry Training Summary Report: A written report issued by the training instructor that describes in detail the approach, techniques, tools, materials, and methods to accomplish a Masonry Treatment Requirement (MTR). The report includes documentation of the individuals that participated in the on-site training component. Each participant who successfully completes individual MTR onsite training components are acknowledged with an ASTM E2659-09 Training Certificate and hardhat decal.

B. Construction Laborer and Helpers: Individuals that assist in the general construction activities at the project site as defined by the Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2012-13 Edition*, Construction Laborers and Helpers. Source: http://www.bls.gov/ooh/construction-and-extraction/construction-laborers-and-helpers.htm

1. SPECIAL NOTE: Construction Laborer and Helper personnel must remain within the defined parameters of their job description for this project as defined by the Bureau of Labor Statistics, U.S. Department of Labor. Thus, these individuals are not permitted to engage in direct labor activities that involve the use of skill-trade tools that come in contact with historic masonry materials on this project.

C. Masonry Treatment Requirement (MTR): This term defines the masonry Work scope task by category that involves deconstruction, harvesting, repair, restoration, preservation, and reconstruction of the historic brick, stone, and mortar specific to this project. The Masonry Treatment Requirements were established from a comprehensive building survey that identified the causes of masonry deterioration patterns by individual masonry units based upon the intended architectural and structural purpose in the building façade.

D. Saturation Coefficient: Ratio of the weight of water absorbed during cold-water immersion to weight absorbed during boiling water immersion. This information can be used as an indication of resistance of masonry units to freezing and thawing.

E. Skill-Trade Restoration Worker: This occupation title is for the purpose of worker identification in relation to the Masonry Treatment Requirements (MTR) for this project. Individuals that have satisfied the education and qualifications required (in the restoration industry/union/trade school/or degree program) attaining a skill-trade position/title as defined by the Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2012-13 Edition*, Brickmasons, Blockmasons, and Stonemasons. Source: http://www.bls.gov/ooh/construction-and-extraction/brickmasons-blockmasons-and-stonemasons.htm

F. Skill-Trade Training Certificate: A certificate earned by an individual skill-trade restoration worker who has successfully completed the on-site training requisites for a specific Masonry Treatment Requirement (MTR).

G. Supervisor: This occupation title is for the purpose of worker identification in relation to the Masonry Treatment Requirements (MTR) for this project. Individuals that are responsible for the over-sight and supervision of skill-trade restoration workers engaged in the direct activities to deliver Masonry Treatment Requirements (MTR) for this project. Individuals may include, but are not limited to: owner's representative, owner project manager, general contractor's superintendent, construction manager, estimator, project superintendent, masonry foreman, subcontractor's project manager, and masonry superintendent as defined by the Dictionary of Occupational Titles for 11-9021.00 – Construction Managers; O*NET OnLine. Source: http://www.onetonline.org/link/summary/11-9021.00

H. Supervisor Training Certificate: A certificate earned by an individual supervisor who has successfully completed the on-site training requisites for a specific Masonry Treatment Requirement (MTR).

I. Training Certificate Program Plan: A documented plan developed by the certificate issuer that includes the essential elements of program design, development, implementation, and evaluation.

J. Training Over-sight Committee: Primary stakeholders formed to develop, monitor, and approve the training certificate program plan within the framework of ASTM E2659-09 Standard Practice for Certificate Programs.

K. Training Certificate Program Process: All activities by which the certificate issuer establishes for a skill-trade restoration worker or supervisor to fulfill specified requisites to earn a certificate, including but not limited to skill-trade prerequisites, completion of an individual "on-the-wall" demonstration of his/her trade-skill proficiency, evaluation of and completion of the intended learning outcomes, and the certificate decision.

L. Very Low-Pressure Spray: Under 50 psi.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include recommendations for application and use. Include test data and supporting procedures specific to this project established during the ASTM E2659-09 Historic Masonry Training Program substantiating that products and methods of approach to historic treatments comply with project requirements. Include Material Safety Data Sheets (MSDS) as appropriate.

B. Quality Assurance Plan: Prior to starting Work, submit a written plan as outlined in the Quality Assurance Section for the work of this Section.

C. Training Program Plan: Submit written documentation of a training certificate program, which complies with ASTM E2659-09 Standard Practice for Certificate Programs specific to the Masonry Treatment Requirements (MTR) of this project. The plan shall include: the number of on-site training components; training program process; intended learning outcomes; evaluation methods; description of preservation methodology; and requisites to earn a skill-trade restoration worker and supervisor certificate.

D. Skill-Trade Certificates: Submit written ASTM E2659-09 project training skill-trade certificates from a qualified Historic Masonry Preservation Consultant / Training Program Instructor verifying that each skill-trade restoration worker (as defined in 1.3 DEFINITIONS) has successfully completed the requisites from the on-site training component specific to the Masonry Treatment Requirement (MTR).

1. "NOTE: The Cost of the Trainer (Historic Masonry Preservation Consultant) and their time is provided by the owner; however, the time of masons and supervisors along with materials required to complete the training is to be included in the scope of the restoration bid. The Training Sessions will include up to eight (8) masons and two (2) supervisors in the training sessions for each MTR. If the restoration contractor requires additional masons to be trained in additional sessions – either because of attrition or staffing decisions, the restoration contractor is responsible for the cost of any additional training sessions that must be scheduled above the original up to 8 masons and 2 supervisors." ***(ADD-1)***

2. Individual skill-trade restoration workers earn skill-trade certificates when requisites are successfully completed at the conclusion of the on-site training. The demonstration of the trade skills necessary to deliver the specific work scope is an important part of the on-site training program. Each skill-trade restoration worker is required to install an individual test panel on the wall. These test panels are used in the evaluation process of workmanship quality and to confirm application and approach of specified material and proper tool use.

The skill-trade restoration worker certificates are non-transferable, cannot be earned by a company, and are valid only for the duration of the project.

3. Skill-trade restoration workers that have earned skill-trade restoration worker certificates are not permitted to delegate, teach, instruct, or supervise other personnel in the learning outcomes and requisites of the completed MTR training component.

4. A skill-trade certificate **can be invalidated / cancelled** by the ASTM E2659-09 training program oversight committee if the individual skill-trade restoration worker is not able to consistently fulfill the training program requisites according to the on-site training program plan and the specification requirements.

5. A construction laborer as defined in 1.3 DEFINITIONS cannot earn a skill-trade restoration worker certificate.

E. Supervisor Certificates: Submit written ASTM E2659-09 project training supervisor certificates from a qualified Historic Masonry Preservation Consultant / Training Program Instructor verifying that each supervisor (as defined in 1.3 DEFINITIONS) has successfully completed the requisites from the on-site training component specific to the skill-trade restoration workers they will over-see performing the Masonry Treatment Requirements (MTR) assigned to them individually.

1. Individual supervisors earn MTR supervisor certificates when requisites are successfully completed at the conclusion of each on-site training component. The supervisor certificates are non-transferable, cannot be earned by a company, and are valid only for the duration of the project. A skill-trade restoration worker is not permitted to earn a supervisor certificate in the masonry treatments assigned to them to perform individually.

2. Individuals that earn a supervisor certificate must attend the entire on-site training component and participate in observing the skill-trade restoration workers during the process of the historic masonry treatment. Supervisors must be engaged in the training session and complete the written testing. They are to evaluate individual skill-trade restoration worker performance on the required test panels with the training instructor.

3. A supervisor certificate cannot be earned from partial or incomplete participation in the training component.

4. A supervisor certificate is required in order to monitor compliance to the quality standards of workmanship, tool choice, and approach to specific tasks as defined in each individual training component for the specified Masonry Treatment Requirements of this project.

F. Historic Masonry Preservation Consultant / Training Program Instructor: The Owner has secured the services of Speweik Preservation Consultants, Inc., 3163 Heritage Pkwy., Elgin, IL 60124, Phone: 224-856-7449, Contact: John Speweik - to schedule and organize the on-site ASTM E2659-09 Historic Masonry Training program for this project.

G. Mock-Ups
1. In place for all flashing types, roofing reglet, materials, and profiles with continuous cleats (if required by the drawings). Mock-ups may remain as part of the work if approved.
2. Mortar joint removal from stone: for wall preparation for repointing: minimum length is 20” both bed and head joint profiles for each mason performing work.
3. Mortar joint removal from brick: for wall preparation for repointing: three courses in height and four brick units wide for each mason performing work.
4. Install mortar joints for repointing stone: minimum length is 20” both bed and head joint profiles for each mason performing work.
5. Install mortar joints for repointing brick: three courses in height and four brick units wide for each mason performing work.
6. Crack injection using approved methods and materials: 12” minimum length.

7. Stone repair: substitute stone repair: repair 3 stones. Multiple variations of colors will be required to match the existing stone surfaces dependent on location - use approved methods and materials.
8. Stone repair: Dutchman stone repair: Provide 3 Dutchman repairs at 3 separate conditions. Only the use of harvested stone will be permitted. Match the surrounding historic stone surfaces texture and color - use approved methods and materials.
9. Stone repair: redress insitu: Redress one windowsill for each mason performing work.
10. Removal and patching of abandoned masonry anchors, fasteners, or embeds.

H. Samples for Selection and Verification:
1. Repointing Mortar: Submit via mock-ups.
Refer to specified materials and the ASTM E2659-09 Training Summary Report for the approved approach, techniques, and methods.

2. Sealant Materials: Submit via mock-ups.
Owner will choose 3 colors to mock-up from the manufacturer's full range.
Gunnable sealant shall be Dow 790 silicone.
Pre-compressed joint sealant/filler shall be Emseal Seismic Colorseal.
Include similar Samples of accessories involving color selection.

3. Crack Injection: Submit via mock-ups.
Refer to the specifications for materials and the ASTM E2659-09 Historic Masonry Training Summary Report for the approved approach, techniques, and methods.

4. Lead T-Caps: Submit via mock-ups.

I. Qualification Data for Masonry Restoration Firm: The contracting firm must submit in writing at least 10 individual projects completed in the last 5 years which they have been the primary masonry specialist. Work must be performed by a contractor with 5 years' documented successful experience in comparable historic stone masonry restoration projects in size, age, and material and who employ personnel skilled in the restoration treatments and rehabilitation process and operations indicated. The written submission must include the following:
1. Name and address of project;
2. Client name, address, and phone number;
3. Date of project completion;
4. Age of building and whether it was listed on the National Register of Historic Places or is designated as a Historic Landmark;
5. How the work scope was specifically delivered to comply with the Secretary of the Interior's Standards for Rehabilitation;
6. Size of project, in terms of square feet of stone masonry restored; and
7. List of materials used on the project (including names and manufacturers).

1.5 QUALITY ASSURANCE

A. For acceptable best practice approach for techniques and methods for this project see the ASTM E2659-09 Historic Masonry Training Summary Reports for each individual Masonry Treatment Requirement (MTR). If any part of this Section and or ASTM E2659-09 Historic Masonry Training Summary Reports appears to be in conflict, the Architect shall make determination of which takes precedence.

B. Quality Assurance Plan: Prior to beginning Work, submit a written Quality Assurance Plan to the Architect and Owner for approval. Allow 2 weeks for review and approval process. Do not proceed without written approval of plan. The Architect and the Owner's Quality Control representative shall review work on a regular basis for conformance with the approved Quality Assurance Plan. The Quality Assurance Plan shall be a "work-in-progress" plan – updated throughout the progress of the project, and at a minimum, include the following items:

1. Describe on-site project training program. Include certificate issuer name and qualifications with specific requisites established to meet the masonry treatment requirements identified in the project documents.

2. Identify the number of skill-trade restoration workers, by name that will be assigned to each MTR. Identify the number of supervisors, by name that will be assigned to each MTR.

3. Describe the method of mobilization and access to work areas. Include the proposed scaffold type and design and how the assembly of the scaffolding will support the weight of the harvested masonry materials during the deconstruction of the parapet. Also include how the scaffolding will be connected to the building without causing damage to the existing masonry surface.

4. Describe methods of dust containment during the work of this Section.

5. Describe methods of protecting the building during construction activities. Include methods of protecting newly installed work from extreme weather conditions. Submit drawings of protection when requested by the Architect.

6. Describe the work procedures, materials, and tools the contractor proposes to use for each Masonry Treatment Requirement (MTR) specified.

7. Describe the sequence of the Masonry Treatment Requirements (MTR).

8. Describe the methods for surveying original layout and collecting datum points and plumb lines for rebuilding brick and stone masonry if required.

9. Describe the methods for shoring and providing a safe working environment.

10. Describe the method and approach to removing cement based mortar joints and cleaning cement-based smears and old patching materials from the face of the historic brick and stone.

11. Describe the method and approach to removing paint materials from the historic brick and stone units and cleaning previous repair smears and old patching materials from the face of the historic brick and stone.

12. Describe, in detail, the matching procedures relating to techniques and tools proposed for repointing the mortar joints.

13. Describe the complete existing mortar removal procedure: include equipment, tools, approach, method, depth, square-back shape, and how the brick and stone will be protected during operations.

14. Describe the documentation procedures to identify the moisture conditions within the brick walls after mortar removal operations. Determine the length of time required in order to dry-out the walls to establish equilibrium of moisture prior to the installation of the new repointing mortar.

15. Describe the procedures for stone repairs to include: crack repairs; Dutchman repairs, redressing insitu; remove, redress and return; remove and replace with new stone; and substitute stone repairs.

16. Describe the methods for setting new replacement stone and harvested stone back into the wall while maintaining original bond patterns and joint widths.

17. Describe the methods for maximizing the use of the existing historic brick during the parapet deconstruction operations. Include methods of mortar removal, cleaning, inspecting brick units, and sorting. Explain how the owner's attic brick stock will be put to use if needed.

C. Project Training Program Definition and Use: All skill-trade restoration workers as defined in 1.3 DEFINITIONS must obtain project skill-trade certificate(s) in order to work on the Masonry Treatment Requirements (MTR). This project has defined ten (10) Masonry Treatment Requirements that will require eleven (11) separate on-site training days for issuance of the required project skill-trade restoration worker and supervisor ASTM E2659-09 Certificates.

1. Masonry Treatment Requirements (MTR):
   MTR-1 Selective Deconstruction and Material Harvesting
   MTR-2 Substitute Stone Repair
   MTR-3 Redressing Stone Insitu
   MTR-4 Dutchman Stone Repair
   MTR-5 Remove, Clean, and Return Stone
   MTR-6 Remove and Replace Stone
   MTR-7 Crack Injection Repair
   MTR-8 Historic Brick Reconstruction
   MTR-9 Mortar Removal
   MTR-10 Lime Mortar Repointing

D. The contractor has the flexibility to assign skill-trade restoration workers that are most proficient in the skills required for the specified masonry treatment requirement. It is not necessary, nor a requirement of this specification, that all skill-trade restoration workers obtain all project certificates offered.

E. The contractor is responsible for mobilization, labor, equipment, specialized tools and material costs associated with the on-site training programs.

F. The project over-sight committee, representing the primary stakeholders, reserves the right to remove any skill-trade restoration worker, construction laborer, or supervisor from the project site who does not comply with the standards and performance criteria and project requirements as described in this Section.

1.6 SUBSTITUTIONS

A. If alternatives to the methods and materials indicated are proposed for any phase of the masonry restoration treatments, the Contractor shall provide written descriptions and programs of testing and install all test panels samples and mock-ups to demonstrate the effectiveness of the alternatives for use on this project. The contractor must provide documentation showing compliance with the requirements for substitutions and the following information:

1. Coordination information, including a list of changes to other work that will be necessary to accommodate the substitution.

2. A comparison of the substituted products and materials with specified products and methods, including performance, weight, size, durability, and visual effect.

3. Certification that the substitution conforms to the contract documents and is appropriate for the applications indicated. Material substitution requests must be accompanied by independent laboratory test reports from a lab designated by the Architect to establish equivalent performance levels and specification compliance. The Architect shall designate the testing lab, and the party requesting the substitution shall pay for the testing.

1.7 REFERENCES

A. ASTM E2659-09 Standard Practice for Certificate Programs

B. TMS 402-08/ACI 530-08/ASCE 5-08

C. The Secretary of the Interior's Standards for Rehabilitation, codified in 36 CFR 67

D. Preservation Briefs 1, "Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings," U.S. Department of the Interior, National Park Service, Cultural Resources, Heritage Preservation Services, Washington, DC, 2000

E. Preservation Briefs 2, "Repointing Mortar Joints in Historic Masonry Buildings," U.S. Department of the Interior, National Park Service, Cultural Resources, Heritage Preservation Services, Washington, DC, 1998

F. Preservation Briefs 6, "Dangers of Abrasive Cleaning to Historic Buildings," U.S. Department of the Interior, National Park Service, Cultural Resources, Heritage Preservation Services, Washington, DC, 1979

1.8 DELIVERY, STORAGE, HANDLING, AND DOCUMENTATION

A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons. Keep masonry materials from coming in contact with the ground.

B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

C. During storage and construction, store restoration materials on elevated platforms, under cover, and in a dry location, protect from staining or intermixture with earth or other types of materials. Do not use cementitous materials that have become frozen.

D. Store pre-blended lime putty mortar material in manufacturer's original and unopened containers.

E. Receive pre-blended mortar buckets and all other restoration products to a secure staging area located onsite.

F. Store pre-blended lime putty mortar buckets covered and protected from extreme heat and cold.

G. Store all materials in a location onsite that will not impede the progress of the work. Protect from vandalism and theft.

1.9 PROJECT CONDITIONS

A. Schedule Constraints: Confirm with Architect acceptable working hours, noise restrictions, dust containment, wastewater runoff and any possible scheduled public events that could limit access to the project site during restoration operations.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.

C. Clean and repair brick and stone masonry units and repoint mortar joints only when air and stone surface temperatures are 40°F (4°C) and rising. Do not proceed with material installation or cleaning if air and brick and stone surface temperatures exceed 95°F (35°C) and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.

D. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar repointing unless otherwise indicated:
   1. When air temperature is below 40°F (4°C), heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 41°F (5°C) and not to exceed 95°F (35°C).
   2. When mean daily air temperature is below 40°F (4°C), provide enclosure and heat to maintain temperatures above 41°F (5°C) within the enclosure for 14 days after repair and repointing.

E. Hot-Weather Requirements: Protect masonry repair and mortar repointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials during and after installation. Provide temporary shade (Burlene blankets/tarps – white plastic lined with burlap) and windbreaks for up to 14 days after installation of repointing mortar if required. Lower temperature of materials as required minimizing evaporation. Do not apply mortar to substrates with temperatures of 95°F (35°C) and above unless otherwise indicated.

F. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

G. Clean masonry surfaces only when air and brick and stone surface temperatures are 40°F (4°C) and above and are predicted to remain so for at least 7 days after completion of cleaning.

H. Prevent mortar from staining the face of the masonry or other surfaces to be left exposed.

I. Cover and protect completed work when work is not in progress.

J. Protect stone sills, ledges, and brick projections from mortar droppings.

1.11 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.

B. Order premixed mortar immediately after approval of mock-ups. Take delivery of and store at Project site a sufficient quantity to complete Project.

C. Perform masonry restoration work in the sequence established in the Quality Assurance Plan.

D. As scaffolding is removed, patch anchor holes if used to attach scaffolding. Repair anchor holes in masonry to comply with methods and procedures established in the on-site training program.

2. PRODUCTS

2.1 ACCESSORY MATERIALS

A. Sealant Materials:
   1. Gunnable Sealant: Dow 790 silicone.
   2. Gunnable Sealant: Dow 756 silicone at limestone.
   3. Colors: Provide colors of exposed sealants to match colors of masonry adjoining installed sealant unless otherwise indicated.

B. Joint-Sealant Backing:
   1. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

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

C. Masking Tape: Non-staining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints. Tape will easily come off entirely, including adhesive.

D. Anti-rust Coating: Conproco ECB

E. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:
1. Previous effectiveness in performing the work involved.
2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:
   a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
   b. Leave a residue on surfaces.

2.2 MORTAR MIXES

A. Repointing Mortar: Refer to the ASTM E2659-09 Historic Masonry Training Summary Report for approved approach, techniques, and methods.

1. Product Manufacturer: U.S. Heritage Group, Inc., 3516 North Kostner Ave., Chicago, IL 60641, Phone: 773-286-2100.
2. Product: The mortar material is produced pre-blended with all ingredients contained in a single container. Contractor shall extract a mortar sample from the building and deliver it to the vendor for matching purposes. The Architect will supply the contractor with the technical information pertaining to the formulation and aggregate selection.
3. Repointing Mortar: Lime Putty Mortar: Type L. Mix design: One part non-hydraulic lime putty, two and one half parts sand (1:2-1/2)

2.3 SUBSTITUTE STONE REPAIR

A. KEIM Mineral Coatings of America, Inc, 10615 Texland Blvd. #600, Charlotte, NC 28273, Phone: 704-588-4811

1. Product: Restauro System – KEIM Restauro-Top; Custom colors to be produced to match existing limestone at the factory based upon samples sent in from the project site.

2.4 CRACK INJECTION

A. DHL Dispersed Hydrated Lime injection material.

1. Manufacturer: U.S. Heritage Group, Inc., 3516 North Kostner Ave., Chicago, IL 60641, Phone 773-286-2100.

2. Spachtel Surface Treatment. Manufacturer: U.S. Heritage Group, Inc., 3516 North Kostner Ave., Chicago, IL 60641, Phone 773-286-2100. Color to match surface of limestone and to cover cracks.

2.5 FLASHING AND WATERPROOFING

A. Metal Flashing: Refer to Section 076000 Flashing and sheet Metal.

B. Rust Inhibitive Coating: Conproco ECB.
1. Clean and prepare all non-removable embedded ferrous shapes and surfaces. Apply two coats to all cleaned surfaces.

C. Lead Mortar Joint Caps: “Weathercap” malleable solid lead covers in shapes and profiles as shown on the drawings: size in width of lead mortar joint caps are dependent on joint width.

1. Manufacturer: Weathercap, Inc., P.O. Box 1776, Slidell, LA 70459, Phone: 985-649-4000. Install with two continuous beads of non-staining Dow 991 silicone in color per approved mock-up.

2. Refer to Weathercap Inc., technical data sheet for installation guidelines.

3. EXECUTION

3.1 GENERAL

A. Refer to ASTM E2659-09 Historic Masonry Training Summary Reports for approved restoration, rehabilitation, preservation, and new installation methods. If any part of this section and any part of the Historic Masonry Training Summary Reports appear to be in conflict, the Architect shall make determination as to which takes precedence.

3.2 PROTECTION

A. Protect all existing historic non-masonry items to remain such as lights, doors, and glass.

B. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
1. Erect temporary protective covers over granite steps using plywood to prevent stone edge chips and spalls or other damage from occurring during operations. Cover walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

C. Prevent mortar from staining the faces of surrounding masonry and other surfaces.
1. Cover sills, ledges, and projections to protect from mortar droppings.
2. Immediately remove mortar in contact with exposed masonry and other surfaces.
3. Clean mortar splatters from scaffolding at end of each day.

3.3 UNUSED OR ABANDONED ANCHOR REMOVAL

A. Follow procedures approved in mock-up submittal. Below is general information.

B. Remove masonry anchors, brackets, wood nailers, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.
1. Remove items carefully to avoid spalling or cracking masonry.

2. Where directed, if an item cannot be removed without damaging surrounding masonry, do the following:
    a. Cut or grind off item approximately 1 inch beneath surface and core drill a recess of same depth in surrounding masonry as close around item as practical.
    b. Immediately paint exposed end of item with two coats of antirust ECB coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.
3. Repair and patch anchor holes that remain with approved materials where each item was removed unless directed to remove and replace the masonry unit. This type of repair requires an approved mock-up.

3.4 PAINTING STEEL UNCOVERED DURING THE WORK

A. Inspect steel exposed during masonry removal. Where Architect determines that it is structural, or for other reasons cannot be totally removed, prepare and paint exposed steel as follows:
    1. Remove paint, rust, and other contaminants according to SSPC-SP 2, "Hand Tool Cleaning" as applicable to meet project and paint manufacturer's required preparation.
    2. Immediately paint exposed steel with two coats of antirust ECB coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

B. If on inspection and rust removal, the cross section of a steel member is found to be reduced from rust by more than 1/16 inch (1.6 mm), notify Architect before proceeding.

3.5 WIDENING JOINTS

A. Do not widen mortar joints during the procedures of mortar removal. The contractor is responsible for any damage. Full replacement of damaged units will be required at no additional cost to the Owner.

3.6 SELECTIVE DECONSTRUCTION AND MATERIAL HARVESTING (MTR 1)

A. Refer to Section 01 35 91 Historic Treatment Procedures for approved methods.

B. Only skill-trade restoration workers (as defined in 1.3 DEFINITIONS, page 2) that have successfully completed the ASTM E2659-09 Historic Masonry Training Component MTR 1: Selective Deconstruction and Material Harvesting will be permitted to execute the work scope defined in this Section.

C. Each skill-trade restoration worker engaged in the execution of the work of this Section shall earn and receive a training certificate and hardhat decal. Training certificates shall remain in the construction field office and are available upon Architect or Owner request.

D. Only skill-trade restoration workers that hold a “Selective Deconstruction and Material Harvesting Skill-Trade Certificate” will be permitted to work on the scope of this Masonry Treatment Requirement as defined.

E. Only supervisors that hold a “Selective Deconstruction and Material Harvesting Supervisor Certificate” will be permitted to supervise and oversee the skill-trade restoration workers during the process of the work.

F. Construction laborers (as defined in 1.3 DEFINITIONS, page 2) are not permitted to earn ASTM E2659-09 Historic Masonry training certificates.

1. Construction laborers and helpers can assist restoration workers in organizing, and collecting the necessary materials, equipment, supplies, and tools to complete masonry treatment requirements (MTR).
2. Construction laborers and helpers are not permitted to engage in the direct activity of masonry treatment requirement (MTR) work on the building or on harvested material for reuse.

3.7 SUBSTITUTE STONE REPAIR (MTR 2)

A. Refer to Section 2.4 for approved materials. Provide materials to match existing stone surface in color and texture. Supply up to six (6) different color and texture samples for evaluation in comparison to various locations on the façade.

B. Substitute stone repairs require a moldable, plastic fill material applied directly to the loss area and set into place by its own adhesion to the stone substrate. Companies that do not sell stone typically offer such substitute stone repair materials.

C. Substitute stone materials may not be installed in widths exceeding 3-inches. Stone repairs in excess of 3-inches in width must utilize a Dutchman repair approach.

D. Remove all loose mortar and masonry prior to the installation of the substitute stone material. “Sound” the masonry with a hammer to verify its integrity. If necessary, cut away an additional ½-inch of the stone substrate to ensure the surface to be repaired is solid and stable. Remove any sealant residue.

E. Apply specified stain to repairs if determined after installation that the substitute stone repair material does not match the surrounding stone surface color. Apply as necessary for Architect approval.

F. Use methods and materials established in the project-training program to deliver the substitute stone repair work as demonstrated and approved by the Architect and Owner.

G. Only skill-trade restoration workers that hold a “Substitute Stone Repair Skill-Trade Certificate” will be permitted to work on the scope of this Masonry Treatment Requirement as defined.

H. Only supervisors that hold a “Substitute Stone Repair Supervisor Certificate” will be permitted to supervise and oversee the skill-trade restoration workers during the process of the work.

I. Follow all manufacturers’ written instructions pertaining to the placement of materials.

3.8 REDRESSING STONE INSITU (MTR 3)

A. Scale off all loose pieces of original stone from masonry intended to remain in place, including surface material in powder or granular form and detachments of planer elements, spalls and chips. Contractor shall sound all stone surfaces on building by using the “ring test method” in order to distinguish fully intact stone from those in which delamination may be hidden or pieces of unstable material may not be immediately visible. Locations designated for redressing are generally surface spalls at the edge of the stone units that do not exceed 1/8” in depth.

B. Use methods established in the project-training program to redress the stone surface to match the original surface textures and profiles as approved by the Architect and Owner.

C. Any stone that is designated for redressing insitu can become a candidate for a substitute stone repair if, after chiseling is completed, the solid stone substrate is no longer in plane or plumb with the surrounding stone masonry surfaces and exceeds a depth of 1/8” and is 2” in width measured from the edge of the stone toward the center.

D. Use methods and materials established in the project-training program to deliver the redressing stone insitu repair work as demonstrated and approved by the Architect and Owner.

E. Only skill-trade restoration workers that hold a “Redressing Stone Insitu Skill-Trade Certificate” will be permitted to work on the scope of this Masonry Treatment Requirement as defined.

F. Only supervisors that hold a “Redressing Stone Insitu Supervisor Certificate” will be permitted to supervise and oversee the skill-trade restoration workers during the process of the work.

3.9 DUTCHMAN REPAIRS (MTR 4)

A. A Dutchman repair is defined as the process of removing damaged stone to a specified depth and inserting a new piece of stone to fit in the opening to create the appearance of a seamless patch.

B. The Dutchman Repair Process: This process involves careful and precise removal of select deteriorated stone material, usually in a larger stone. The Dutchman repair will be required on stones with surface face loss which exceeds the maximum and minimum dimensions described below:

1. Stone surface loss which exceeds 2 inches or more measured from the edge of the stone toward the center and exceeds a depth of 1/8”

2. The removal of an existing stone patch exceeding the measurements of 2 inches or a depth of 1/8 inch.

C. The new piece of stone must be exactly fitted into place with tolerances of no more than +/- 1/16-inch. Supporting rods of stainless steel may be necessary for some Dutchman repairs, depending on the extent of the repair and the location. A height to length ratio of 3 to 1 shall govern the size of the Dutchman unless otherwise specified by the Architect. A Dutchman shall be a minimum of 2” in thickness.

D. Adhere the Dutchman with the specified bonding mortar. Prior to adhering with mortar, the new piece of stone shall be carved and refined to match the surface of the adjacent original stone in both profile and finish. This step is necessary to allow for a virtually invisible replacement repair.

E. Use methods and materials established in the project certificate-training program to deliver acceptable Dutchman repair work as demonstrated and approved by the Architect and Owner.

F. Only skill-trade restoration workers that hold a “Dutchman Repair Skill-Trade Certificate” will be permitted to work on the scope of this Masonry Treatment Requirement as defined.

G. Only supervisors that hold a “Dutchman Repair Supervisor Certificate” will be permitted to supervise and oversee the skill-trade restoration workers during the process of the work.

3.10 STONE REMOVAL, CLEAN, AND RETURN (MTR 5)

A. Before removing any solid or deteriorated stone masonry units from the building, establish bond patterns, levels, and coursings. Label each stone unit to be removed in a logical sequence for its return to the same location. The contractor is responsible for developing a stone numbering system by elevation section and location as required in the specification documents.

B. Carefully remove entire stone unit from joint to joint, without damaging surrounding stone, in a manner that permits reinstallation in the same location.

C. Support and protect remaining stonework that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry back-up, rotted wood, rusted steel, and other deteriorated items.

E. Remove all mortar and sealant residue from bedding surfaces of the stone units before reinstallation. Clean with hand chisels, utility knives, and cleaning solvents.

F. Use methods established in project training program to remove, redress, and return stone to match the original surfaces and profiles as approved by the Architect and Owner.

G. Butter vertical joints for full width before setting stone units in full bed of mortar, unless otherwise indicated.

H. Only skill-trade restoration workers that hold a “Remove, Clean, and Return Skill-Trade Certificate” will be permitted to work on the scope of this Masonry Treatment Requirement as defined.

I. Only supervisors that hold a “Remove, Clean, and Return Supervisor Certificate” will be permitted to supervise and oversee the skill-trade restoration workers during the process of the work.

3.11 STONE REMOVAL AND REPLACEMENT – FULL OR PARTIAL (MTR 6)

A. Before removing any solid or deteriorated stone masonry units from the building, establish bond patterns, levels, and coursings. Remove stone to maximize the possibility of original surface reuse in Dutchman repair stock at other locations. The contractor is responsible for developing a deconstruction method of removal that enables stone harvesting.

B. Carefully remove entire stone unit from joint to joint, or a partial stone, without damaging surrounding stone, in a manner that permits installation of a new replacement stone.

C. Support and protect remaining stonework that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry back-up, rotted wood, rusted steel, and other deteriorated items.

E. Remove all mortar and sealant residue from bedding surfaces of the stone units before installation. Clean with hand chisels, utility knives, and cleaning solvents.

F. Use methods established in project training program to remove and replace stone to match the original surfaces and profiles as approved by the Architect and Owner.

G. Butter vertical joints for full width before setting stone units in full bed of mortar, unless otherwise indicated.

H. Only skill-trade restoration workers that hold a “Remove and Replace Skill-Trade Certificate” will be permitted to work on the scope of this Masonry Treatment Requirement as defined.

I. Only supervisors that hold a “Remove and Replace Supervisor Certificate” will be permitted to supervise and oversee the skill-trade restoration workers during the process of the work.

3.12 CRACK INJECTION REPAIR (MTR 7)

A. General: Comply with Dispersed Hydrated Lime manufacturer's written instructions.

B. Those cracks designated on drawings, where stone is soundly bonded but cracked, shall be injected. Unless otherwise noted, the intent of this specification is for the designated cracks to be injected their full lengths, not just locally where markings are noted on the drawings.

C. Drill 1/8-inch holes in diameter, downward sloping angles into cracks and inject holes as follows:

1. Drill holes into the center of cracks and transversely approximately 1-inch apart and ½-inch in depth.

2. Clean out drill holes and cracks with compressed air and distilled water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.

3. Use a syringe and inject the DHL material starting from the bottom hole upwards, filling each hole as the process proceeds. Clean up any over-running material immediately as it flows from the crack surface.

4. Allow the material to draw into the crack through capillary action until it becomes tacky. Re-apply the material in the low spots of the crack, refilling the holes until they become completely full. This may require a wait time of approximately five minutes.

5. Scrape excess material away after 30 minutes. Apply Spachtel Surface Treatment to the crack surface to blend in the repair with the surrounding stone surfaces.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Use methods, techniques, tools, and approach as identified in the project-training program and as demonstrated by the test panels approved by the Architect.

F. Only skill-trade restoration workers that hold a "Crack Repair Skill-Trade Certificate" will be permitted to work on the scope of this Masonry Treatment Requirement as defined.

G. Only supervisors that hold a "Crack Repair Supervisor Certificate" will be permitted to supervise and oversee the skill-trade restoration workers during the process of the work.

3.13 HISTORIC BRICK RECONSTRUCTION (MTR 8)

A. Before removing any solid or deteriorated historic brick masonry units from the building, establish bond patterns, levels, and coursings. Remove brick to maximize the possibility of original surface reuse in reconstruction operations. The contractor is responsible for developing a deconstruction method of removal that enables brick harvesting. Refer to Section 006600 Special Conditions for additional information on n previously salvaged brick that is available on site.

B. Carefully remove entire brick unit from joint to joint, or a partial brick, without damaging surrounding brick, in a manner that permits installation of a new or harvested replacement brick.

C. Support and protect remaining brickwork that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

D. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry back-up, rotted wood, rusted steel, and other deteriorated items.

E. Remove all mortar and sealant residue from bedding surfaces of the brick units before installation. Clean with hand chisels, utility knives, and cleaning solvents.

F. Use methods established in project training program to remove and replace and reconstruct brickwork to original design details as approved by the Architect. Match the original mortar surface profiles, bond patterns, corbelling, and embellishments as approved by the Architect and Owner.

G. Butter vertical joints for full width before laying brick units in full bed of mortar, unless otherwise indicated.

H. Only skill-trade restoration workers that hold a "Historic Brick Reconstruction Skill-Trade Certificate" will be permitted to work on the scope of this Masonry Treatment Requirement as defined.

I. Only supervisors that hold a "Historic Brick Reconstruction Supervisor Certificate" will be permitted to supervise and oversee the skill-trade restoration workers during the process of the work.

3.14 MORTAR REMOVAL (MTR 9)

A. Rake out joints 2½ times the width of the joint and according to procedures demonstrated in approved mockup and established during the on-site training program.
   1. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar.
   2. The square back reveal shape may require the removal of internal hidden stone material. This condition is typically a result of previous repointing campaigns that widened the joint profile at the face of the wall.
   3. Brush or vacuum joints to remove dirt and loose debris.
   4. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
   5. Follow guidelines described in the Preservation Brief No. 2 "Repointing Mortar Joints in Historic Masonry Buildings."
   6. Contractor shall use the center-cut-method (CCM) for mortar joint removal.

B. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

C. Use methods, techniques, tools, and approach as identified in the project-training program and as demonstrated by the test panels approved by the Architect.

D. Only skill-trade restoration workers that hold a "Mortar Removal Skill-Trade Certificate" will be permitted to work on the scope of this Masonry Treatment Requirement as defined.

E. Only supervisors that hold a "Mortar Removal Supervisor Certificate" will be permitted to supervise and oversee the skill-trade restoration workers during the process of the work.

3.15 LIME MORTAR REPOINTING (MTR 10)

A. Repointing Application:
   1. Refer to ASTM E2659-09 Historic Masonry Training Summary Report for approved approach, techniques, and methods.

B. Walls should be presoaked with water 10 minutes prior to repointing. Walls should be permitted to draw up the moisture to a saturated surface dry condition (SSD) with no standing water present prior to application of the repointing mortar.

C. Walls should be misted with water for the duration of at least 3 minutes at the end of the day after initial installation. Keep newly repointed walls from drying out too quickly. Moisten down the walls with water three times per day for the first three days after installation, including weekends and holidays.

D. Use methods, techniques, tools, and approach as identified in the project-training program and as demonstrated by the test panels approved by the Architect.

E. Only skill-trade restoration workers that hold a “Lime Mortar Repointing Skill-Trade Certificate” will be permitted to work on the scope of this Masonry Treatment Requirement as defined.

F. Only supervisors that hold a “Lime Mortar Repointing Supervisor Certificate” will be permitted to supervise and oversee the skill-trade restoration workers during the process of the work.

3.16 FINAL CLEANING

A. Refer to approved mock-up panels for methods and materials as directed by the Architect.

3.17 FIELD QUALITY CONTROL

A. Inspectors: The Architect will engage a Masonry Preservation Consultant to perform Quality Assurance Observation Inspections. The Masonry Preservation Consultant will prepare a Work-in-Progress field report on the quality of the work. The contractor shall allow the use of lift devices and scaffolding, as needed, to perform the inspections.

END OF SECTION 04 01 20

SECTION 040121
EXTERIOR MASONRY CLEANING

Revised September 24, 2014 to reflect full building test results and reviewed with Milwaukee City Preservation, Paul Jakubovial

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cleaning of masonry surfaces and adjacent mortar joints.
   2. Protection of adjacent surfaces.
   3. Protection of adjacent surroundings.
   4. Cleaning up of debris, waste, and rubbish.

B. Related Sections:
   1. Section 012300 – Alternate Bids.
   2. Section 013591 – Historic Treatment Procedures.
   3. Section 040120 – Maintenance of Historic Masonry

1.2 REGULATORY REQUIREMENTS

A. Municipal, State and Federal regulations governing cleaning means and methods, scaffolding, and protection of adjacent and public properties.

1.3 REFERENCES

A. Materials and methods shall conform to the "Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings", 1995 including “Preservation Brief 1 – Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings (2000)”.

B. Comply with the cleaning recommendations of the National Park Service Technical Preservation Services Division as outlined in: Keeping it Clean: Removing Exterior Dirt, Paint, Stains and Graffiti from Historic Masonry Buildings, Preservation Assistance Division (1988), except as modified by these Specifications.

1.4 SUBMITTALS

A. Contractor’s Work submissions:
   1. Submit written document to Architect describing in detail: methods and materials to be used for required cleaning.
   2. Submit written plan to Architect describing in detail: methods and materials to be used protecting surrounding surfaces, property and the general public.
      a. Submit shop drawing that shows how the effluent will be collected, contained, and disposed according to federal and local regulations.

B. Manufacturer’s product data:
   1. Submit Manufacturers’ literature for cleaning materials to be used including: product data, use limitations, specifications and MSDS. Include certification that each product submitted complies with specified requirements.
   2. Submit Manufacturer's technical product literature for all specified stain removal and cleaning products.

C. Samples submission:
   1. Submit samples in original, unopened containers of each cleaning agent to be tested.
   2. Submit sample of agent proposed for protection of all metal and polycarbonate materials from acids and alkaline cleaning agents.
   3. Submit sample of solvent-resistant polyethylene sheeting for protection from acid and alkaline cleaning agents.

1.5 MOCK-UP TESTING

A. A mock-up test panel has been completed on site.

B. Purpose: To determine appropriate cleaning agent, strength and dwell time of cleaning agent, method of application, method and duration of rinsing, and to ensure that cleaned masonry surfaces can be obtained with no detrimental effect to masonry or other materials on or adjacent to the facades.

C. Execution of testing: Apply materials as specified to designated areas, for soiling and staining (i.e. general soiling, gypsum crusts, iron stains, copper stains, and biological growth) of masonry.
   1. Follow all product manufacturers' application instructions unless otherwise noted
   2. Modify dwell time as needed to achieve satisfactory results. Rinse until pH of wet limestone and brick is equal to that of clean water from tap.
   3. The lowest strength cleaning agent bringing the desired degree of cleaning shall be used.

D. Mock-Up Panel:
   1. Provide two test panels measuring four (4) square feet (2' x 2'), for approval by Architect prior to commencing cleaning Work.
      a. Location shall be chosen to be representative of the effect of cleaning materials and methods on the most heavily soiled areas.
      b. Test Panel 1: Provide a single application of cleaning agent per the specifications.
      c. Test Panel 2 Provide two separate applications of cleaning agent per the specifcation
   2. Unacceptable test results: Repeat cleaning tests as required until desired results are reached and approval of materials and methods are obtained. Do not proceed with cleaning until Architect has given written approval.
   3. Great care should be taken using iron and copper stain remover products to avoid adverse reactions and additional staining. Products tested for the removal of iron stains and copper stains should be on area no more than 1' x 1'.
   4. Approved test area will serve as the standard for judging completed work and shall remain in place for the duration of the Work.

1.6 QUALITY ASSURANCE

A. Contractor qualifications:
   1. Restoration work shall be performed by firm with not less than 5 years of successful experience in masonry cleaning work employing workers skilled in their trade.
   2. Resume of foreperson shall be submitted documenting a minimum of five (5) years of experience cleaning historic masonry. Mechanics shall have skill and experience of sufficient level to accomplish the work described. Mechanics shall be carefully supervised to ensure that the work is accomplished to meet or exceed the highest standards of the trade. In acceptance or rejection of cleaning, no allowance will be made for lack of skill on the part of the mechanics.

B. Obtain materials for masonry cleaning from single source for each type of material required.

C. Chemical Manufacturer Qualifications: Company regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project site inspection and assistance at no additional cost.

1.7 PRODUCT HANDLING

A. Deliver materials to the job site in original unopened containers bearing manufacturer and product name and label.

B. Store and handle materials in strict compliance with manufacturer's instructions.

C. Do not store materials on the ground.

D. Protect materials from tampering, acts of vandalism, possible injury to workers, the general public, intrusion of foreign materials and moisture. All vessels shall have tight fitting covers. At no time shall vessels containing chemicals be carried to working levels when vessels are open.

1.8 ENVIRONMENTAL REQUIREMENTS

A. City, State and Federal requirements: Comply with health, and safety code requirements regarding Work of this section including: compliance regarding VOCs, protection, effluent collection and disposal. Obtain City of Milwaukee Health Department approvals.

B. Do not allow run off from the cleaning process to enter storm and sanitary drains, catch basins, and sewer system, contaminate water supplies, or to enter natural bodies of water.

C. Disposal of effluent and other wastes in a safe and legal manner.

D. Weather conditions:

1. Cleaning shall not begin until average daily temperatures remain above 40°F (4°C). Do not clean during adverse weather conditions, except to wash down any cleaning agent already applied. Contractor shall alter cleaning procedures if considered necessary because of temperature changes.
2. Cold weather protection: Do not clean if the temperature of air or masonry drops below 40°F (4°C). Do not clean within seven days of anticipated freezing temperatures.
3. Hot weather protection: If temperatures rise above 85°F (29°C), protect areas being worked on with tarps or other shading devices to reduce heat from direct sun. Do not allow chemicals to dry on masonry.
4. Protection from wind: Do not spray-apply chemicals on windy days. Protect all surrounding areas and the general public from wind carried chemicals.

1.9 PROTECTION

A. Prevent chemical cleaning agents from spilling or dripping down surfaces, on to adjacent materials, or on to the ground. Remove any spilled or dripped materials immediately and rinse well.

1. Provide adequate protection from chemical cleaning agents and rinse water for all glass, metal, and polycarbonate surfaces around and beneath the surfaces being worked on and any adjacent surfaces not included in this work.
2. Apply masking agent to comply with manufacturer's recommendations. Do not apply liquid masking agent to painted or porous surfaces.
3. Protect windows, doorways, trim and other surfaces from damage and immediately remove stains, efflorescence, or other unsightly excess resulting from work of this section.

B. Take all necessary precautions for the protection of property and public safety from cleaning agents, rinse water, and wind-drifting chemical cleaners and water.

1. Protect surrounding areas from contact with chemical cleaning agents and rinse water. Surrounding areas shall include, but shall not be limited to, adjacent surfaces and structures, public property and rights-of-way, private property including automobiles, vegetation, and all other surfaces that would be adversely affected if placed in contact with the cleaning agents. Contractor vehicle parking, and deliveries must be coordinated accordingly.
2. Do not allow run-off from the cleaning process to enter storm sewer system, contaminate water supplies or to enter natural bodies of water. Dispose of effluent in safe and legal way as outlined in the approved shop drawings.
3. Avoid exposing pedestrians to fumes.
4. The Contractor shall provide, erect, and maintain barricades, danger signals, and warning signs as needed.

C. Use all necessary precautions to protect persons performing the work and others from harmful effects of cleaning agents and rinse water.

1. Workers shall be required to wear protective clothing including but not limited to: goggles, face shields, gloves, rubber or polyethylene complete body coverage suits, boots, protective head gear and other clothing or equipment in compliance with MSDS, governing Federal, State, and local safety codes and regulations.

PART 2 PRODUCTS

2.1 MASONRY CLEANING AGENT

A. Masonry Cleaning Agent: Detergent and acid solutions of type and strength specifically formulated for cleaning historic masonry surfaces, as recommended by cleaning solution manufacturer for intended use.

1. Cleaning agent shall be diluted, ~~1:2 or more or as recommended by manufacturer~~ use 75% cleaning agent with 25%water (use greater than 75 ~~50~~% only with written consent of the Architect).

B. Containment and neutralization products as recommended by cleaning solution manufacturer.

C. Manufacturer and Product:

1. Dietrich Industries, Inc.; 101 Masonry Restoration Cleaner.
2. Dummond Chemmicals, Inc.; Peel Away 1 ~~Diedrich Industries, Inc.; 606 Multi-Layer~~ Paint Remover
3. Diedrich Industries, Inc.; 101-G Granite, Terra Cotta, & Brick Cleaner

2.2 EQUIPMENT

A. Brushes: Stiff natural bristle brushes; soft-fibered masonry washing brushes. Use of metal brushes is not acceptable.

B. Spray Applicator: Acid-resistant airless low-pressure (40-50 psi) sprayers with soft, densely fibered synthetic brushes.

C. Pressure Washer: Fan-shaped spray-tipped pressure washer with normal operating pressure range at an angle of 45°, of 50-500 psi, maximum and capable of providing a flow rate of 6 gallons per minute for cleaning operation.

D. Acceptable equipment shall not have metal parts or fittings that can corrode or deposit corrosive materials on the masonry.

2.3 ACCESSORY MATERIALS

A. Water: Clean, potable, and free of amounts of oils, acids, alkalis, salts, organic materials or other substances that may be deleterious to mortar, masonry units, or any metal in the walls.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine existing masonry surfaces and conditions under which Work is to be performed.

B. Before starting any Work of this section, the Contractor shall make a complete inspection of all façade surfaces, associated elements and conditions to confirm all surfaces to be cleaned and all areas that will require special care in cleaning. Review existing conditions of concern (e.g. open joints, deteriorated masonry etc.) and carefully inspect for unexpected conditions. Do not proceed until discrepancies are resolved.

C. Prior to beginning cleaning, determine degree of cleaning to be carried out and review areas requiring additional treatment with the Architect. Approved cleaning test panels will serve as the standard for cleaning.

D. Confirm work to be performed by others to protect or remove identified building items is complete prior to starting Work.

3.2 PREPARATION

A. Close off, seal, mask and board up areas, materials and surfaces not receiving work of this Section to protect from damage.

B. Construct dustproof and weatherproof partitions to close off occupied areas from work of this Section.

C. Comply with chemical cleaner manufacturer's written instructions for protecting building surfaces against damage from exposure to their products.

D. Comply with requirements for Worker protection.

3.3 RESTORATION CLEANING OF EXISTING MASONRY

A. Wetting: Wet masonry, as recommended by manufacturer of cleaning agent.

B. Cleaning:
   1. Take pH reading of masonry prior to the application of cleaning chemicals.
   2. Apply approved cleaning product in approved dilution for recommended dwell time. Allow sufficient dwell time for solution to remain on masonry and agitate with soft fiber brush or sponge as necessary. Recommended dwell time: 5 – 10 minutes.
   3. Rinsing:
      a. Wand nozzle shall be kept at minimum 1 foot away from the masonry surface. A dowel may be taped to the wand that projects 1 foot beyond the nozzle to ensure that the nozzle remains at minimum 1 foot way from the surface.
      b. Rinse as required using a pressure washer set to not exceed 500 PSI (or less as required by municipal code restrictions).
         1) Water pressure above 500 psi must have the written permission of the Architect and must comply with City of Milwaukee regulations/requirements and SHPO/NPS and Recommendations for Masonry Cleaning.
      c. Wash each portion of masonry surface with concentrated water pressure spray. Pressure rinse from the bottom of cleaned area upward and then down again covering each section of the surface. Take great care to ensure that all chemical is rinsed from masonry.
      d. Apply rinse water so all traces of chemical cleaning agents are completely removed.
      e. Use pH strips to test the masonry surface to ensure that the wall surface pH matches that of the rinse water. If it does not, re-rinse the wall or re-neutralize the surface and then rinse. Repeat pH testing of the wall. Repeat process as necessary until wall pH equals that of the rinse water.

C. Reapply chemical cleaners as necessary until masonry is clean to the satisfaction of the Architect.
   1. Areas that remain soiled/stained after initial cleaning, to be spot cleaned using 100% cleaning agent.

D. After rinsing cleaned areas, and areas below and surrounding cleaned areas, allow them to thoroughly dry.

E. All runoff water to be captured in dikes or trenches, neutralizing agent to be applied to the runoff water per manufacturers written instructions until pH of the runoff water is neural and meets City Of Milwaukee Storm Water requirements.

3.4 CLEANING OF EXISTING INDUSTRIAL COATINGS MASONRY

A. Dummon Peel Away 1 ~~Diedrich 606 Multi-Layer~~ Paint Remover will be applied either by roller and/or stainless steel corrosion-resistant airless sprayer fitted with viton, Teflon or other caustic resistant seals and hoses. Setting will be at lowest possible pressure to prevent atomization of the stripper. Paint stripper should be applied in a uniform manner at full strength and let stand as necessary to soften whatever number of coats may be on surface. To rinse, the material should be pressure washed with approximately 500 PSI or less not to damage the existing masonry brick.
   1. Provide collection system to collect run-off from industrial coatings impacted with lead removal. All removed coating waste to be properly stored in labeled containers and legally transported for disposal in an EPA licensed land fill. Maintain all records of shipments.
   2. The remover may leave a light white staining which is to be removed with the Diedrich 101-G.
   3. The proper personal protective equipment to be utilized and the work to be performed by licensed EPA trained workers.

B. Diedrich 101-G will be applied in a diluted state at approximately 10:1 concentrate to water. This will vary due to how dirty brick remains. The cleaner should be applied in a uniform manner and immediately rinsed with a low PSI pressure washer fitted with a fan type tip

3.5 CLEANING

A. Promptly remove cleaning products as work proceeds and upon completion,.

B. Clean adjacent and adjoining surfaces of excess and rinsed materials arising out of execution of Work of this section.

C. Properly and legally dispose of all refuse and remove all materials from the work site.

END OF SECTION

SECTION 040516
MASONRY MORTARING AND GROUTING

Revised BP-1, Addendum No. 2, August 14, 2014

PART 1 GENERAL

RELATED DOCUMENTS
Applicable provisions of Division 01 shall govern work under this Section.

1.1 SUMMARY
A. Section Includes:
   1. Masonry grout for unit masonry parapet repairs.
   2. Admixtures for mortar and masonry grout.

B. Related Sections:
   1. Section 040520 - Masonry Accessories.
   2. Section 040120 – Maintenance of Historic Masonry.

1.2 REFERENCES
A. IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

B. IMIAC (International Masonry Industry All-Weather Council) - Recommended Practices and Guide Specifications for Hot Weather Masonry Construction.

1.3 SUBMITTALS
A. Submit manufacturer's recommendations and product data in accordance with the General Conditions.

B. Submittals shall be in accordance with the General Conditions and be prepared by an approved testing laboratory.

C. Mortar Submittals: Submit mix designs for each type of mortar to be used and state building and landscape components in which each will be used.
   1. Refer to Section 040120 Maintenance of Historic Masonry for mortar to be used with historic brick and stone
   2. Indicate whether proportion or property specification of ASTM C270 is used on each mix design.
   3. Submit Reference Test data as specified by ASTM C270.
   4. Submit Reference Test data indicating minimum bond strength of 20 psi when tested in accordance with ASTM E518 or 100 psi when tested in accordance with ASTM C1072.

D. Submit mix designs for each type of masonry grout to be used and state building components in which each will be used. Use proportion specification of ASTM C476 as minimum criterion and design for minimum compressive strength of 3000 psi when tested in accordance with ASTM C1019. Submit Reference Test data.

E. Prior to installing unit masonry using colored mortar, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects of materials and execution.

1.4 QUALITY ASSURANCE
A. Testing of Mortar and Masonry Grout shall be by approved testing laboratory as specified in General Requirements.

B. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate. Choose mortar ingredients that will not produce effloresence.

1.5 TESTING

A. Use representative samples of mortar and masonry grout materials and proportions to be utilized in construction.

B. Mortar Tests:
   1. Perform tests of mortar and mortar materials to ensure conformance with requirements stated herein.
   2. Flexural Bond Strength Test: ASTM E518 or ASTM C1072.
   3. Mortar Composition and Properties: Test and evaluate per ASTM C780. For compressive strength tests, provide 3 inch by 6 inch mortar cylinders.
   4. Water Retention Tests: ASTM C91, Article 20.

C. Masonry Grout Tests:
   1. Sampling and testing of masonry grout shall be in accordance with ASTM C1019.
   2. Masonry units used to create molds for samples shall be same type of units used in construction. Wood blocks shall be at base of sample and permeable liner shall be used at sides of sample to prevent bond with masonry units. Molds and sample shall remain undisturbed for 48 hours prior to transporting samples to laboratory. Sample size shall be 3 1/2 inches square by 7 inches high.

D. If mortar tests do not indicate conformance with requirements stated herein, re-establish and resubmit for further testing. Pay costs for required retesting.

E. Payment of Reference Tests (tests performed prior to construction): By Contractor.

F. Payment of Construction Progress Tests (tests performed during construction): By Owner.

1.6 PRODUCT HANDLING

A. Storage: Store mortar materials off ground, under cover, and in dry location.

PART 2 PRODUCTS

2.1 MORTAR MATERIALS *(ADD-2)*

A. REBUILING MORTAR FOR PARAPET RECONSTRUCTION SHALL BE ASTM C270 PROPORTION SPECIFICATION TYPE O MORTAR. Mix design: 1 part Portland cement; 2 parts hydrates lime; 8 parts sand. Material must be factory produced. Mixing of individual ingredients at the site will not be permitted."

B. "All other brick and stone rebuilding within the facade elevations shall be lime putty mortar as specified in SECTION 04 01 20."

~~C. Portland Cement: ASTM C150, Type I, non-staining without air-entrainment and of natural color. Refer to Section 040120 Maintenance of Historic Masonry for mortar materials used for historic brick and stone.~~

~~D. Masonry Cement: **Masonry cement not allowed**.~~

~~E. Aggregates for Mortar: ASTM C144.~~

~~F. Aggregates for Masonry Grout: ASTM C404.~~

~~G. Hydrated Lime: ASTM C207 Type S, without air-entrainment.~~

~~H. Premix Mortar: Commercially prepared premix of low alkali Portland cement, hydrated lime, and aggregates; ASTM C387; mortar Type M, S, N.~~

~~1. Optional Mortar Cement (in lieu of Portland Cement and Lime); Lafarge Mortar Cement Complying with Uniform Building Code for Mortar Cement. Use at Contractor's option.~~

I. Water: Potable.

~~2.2 ADMIXTURES~~ *(ADD-2)*

~~A. Mortar Color: Premeasured, non-fading, concentrated mineral oxide pigment, appropriate for addition to Portland cement/lime mortar mix.~~

~~1. Provide in color as selected from manufacturer's standard range.~~

2. Manufacturers:
   a. Tamms Industries,
   b. Solomon Grind-Chem Service,
   c. Euclid's Super Concentrated Mortar Color,
   d. DCS Color and Supply,
   e. Prism Pigments.

B. Chemical Resisting Mortar:

1. Manufacturers:
   a. Atlas Minerals and Chemicals,
   b. Ceilcote Company,
   c. Ameron Corrosion Control Division.

C. Latex Additive: Brock-White latex liquid or Duraweld.

1. Use for mortar at stone sills, and wall caps.

2.3 MORTAR MIXES ***(ADD-2)***

A. Mortar for Non-Load Bearing Interior Walls and Partitions: ASTM C270, type as scheduled using Proportion specification.

B. Mortar for Structural Unit Masonry (indicated on structural drawings): ASTM C270, type as scheduled using Property specification.

C. Pointing Mortar: ASTM C270. Type as scheduled using proportion specification.

D. Stain Resistant Pointing Mortar: ASTM C270. Type as scheduled using proportion specification.

E. Mortar for parging: Use Type S for use below grade or to be covered with waterproofing.

2.4 MASONRY GROUT MIXES

A. For use in filling bond beams, concrete unit masonry cells with reinforcing bars, and other cells or cavities as indicated. Comply with ASTM C476.

B. Use coarse grout in grout spaces 2 inches or more in least horizontal dimension, unless otherwise indicated.

C. Use fine grout in grout spaces less than 2 inches in least horizontal dimension, unless otherwise indicated.

D. Add sufficient water to produce mix of suitable consistency for placing without segregation. Slump range: 8 inches to 11 inches.

E. Use fine aggregate size No. 2 for fine grout and coarse aggregate size No. 8 for coarse grout in accordance with ASTM C404.

PART 3 EXECUTION

3.1 MIXING MORTAR

A. Mortar Ingredients: Thoroughly mix in accordance with ASTM C270 in quantities needed for immediate use.

B. Mortar Admixtures: Add in accordance with manufacturer's recommendations. Ensure uniformity of mix and colorations.

1. Consult with and follow manufacturer's directions on: Use, quantity and mixing of admixtures; various conditions affecting mixing and pouring; mix designs and procedures. Show proposed admixtures on mix designs and do not use unless shown.

C. Ensure that sand is uniformly damp immediately before mixing.

D. Do not use anti-freeze compounds to lower freezing point of the mortar. Do not use calcium chloride in the mortar.

E. Use mortar within 2 hours of mixing at temperatures over 80 degrees F and 2-1/2 hours at temperatures under 50 degrees F.

F. If water is lost by evaporation, retemper mortar only within 2 hours of mixing. Do not retemper mortar after 2 hours of mixing.

3.2 MORTAR TYPE SCHEDULES

A. Exterior Cavity Wall: Type S mortar in masonry back-up wall with Type N mortar in face brick veneer.

B. Interior Bearing Walls: Type S mortar.

C. Masonry Below Grade: Type S mortar.

D. Parge Coat: Type S mortar.

E. Interior Non-Load Bearing Walls: Type N mortar.

F. Glass Unit Masonry: Type N mortar with Type O pointing mortar.

3.3 MORTAR COLOR SCHEDULES

A. Mortar Color: Color as selected.

3.4 MIXING MASONRY GROUT

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

B. Add admixtures in accordance with manufactures instructions. Mix thoroughly.

C. Do not use anti-freeze compounds to lower the freezing point of the grout. Do not use calcium chloride in the grout.

3.5 CONSTRUCTION PROGRESS TESTING

A. Mortar Testing: Provide two 3 inch by 6 inch mortar cylinders as described in Article 1.5 on first 10,000 masonry units laid or first 2 weeks work whichever occurs first. Thereafter if tests are acceptable, provide 2 test cylinders for each 50,000 masonry units or every 4 weeks, whichever occurs first.

B. Masonry Grout Testing: For every 15 cubic yards of masonry grout placed, or for each days work when less than 15 cubic yards is placed, provide 3 samples. Test 1 sample at 7 days of age for projecting probable 28 day strength and 2 samples at 28 days for acceptance of average as required for evaluation and acceptance per ACI 318.

END OF SECTION

SECTION 040520
MASONRY ANCHORAGE, REINFORCING AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Masonry reinforcing.

B. Related Sections:
   1. Section 040120 - Maintenance of Historic Masonry
   2. Section 040516 - Masonry Mortaring and Grouting

1.2 SUBMITTALS
A. Submit in accordance with the General Conditions.

B. Product Data: Submit product literature for each masonry accessory.

C. Shop Drawings: List and mark bars showing quantities, sizes, lengths, locations, bending details and ASTM designations.
   1. Show locations, type and quantities of bolsters, spacers, chairs, support bars and other accessories.
   2. Show bar locations from face of walls.

PART 2 PRODUCTS

2.1 MASONRY REINFORCEMENT
A. Deformed Reinforcing Bars for Wall Reinforcing: Steel Reinforcing Bars at Concrete Unit Masonry; ASTM A615, Grade 60, or comply with Section 032000.

2.2 MASONRY ANCHORS AND TIES
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Heckman Building Products.
   2. Dur-O-Wal Incorporated.
   3. Hohmann and Barnard Incorporated.
   4. AA Wire Products Co.

B. (HORIZ REINF-1) Horizontal Reinforcing at Concrete Unit Masonry: Continuous Wire Joint Reinforcing with 9 gage side rods and crossrods.
   1. Use hot dipped galvanized wire ASTM A53, Class B-2 (1.5 oz. PSF) for exterior masonry walls.
   2. Use mill galvanized wire ASTM A641. Class 1 (0.40 minimum zinc coating) for interior masonry walls.
   3. Use prefabricated corners and tees at wall intersections.
   4. Acceptable Manufacturers:
      a. Dur-O-Wal: Truss-type D/A 310.
      b. Comparable product of other specified manufacturers.

PART 3 EXECUTION

3.1 REINFORCEMENT LOCATION AND SPACING
A. Reinforcement: Locate and space as indicated on drawings. If not indicated provide joint reinforcing as follows:
   1. 16 inches o.c. vertical dimensions, continuous full length of wall.
   2. At bed joint at top course of wall or partition, continuous full length of wall.
   3. In first and second courses below and above each wall opening, extending at least 3 feet beyond opening jamb, in addition to continuous reinforcing noted under #1 above.
   4. At foundation walls with earth both sides, provide only at top 2 courses.

5. Do not carry through control or expansion joints.
6. At composite walls, without cavity, provide extended type reinforcing; full width (less one inch each side) of block and brick wythes.
7. Provide ties at 16 inches on center each way. Thoroughly embed wall ties for face brick.
8. Refer to structural drawings for locations of steel reinforcing bars.
9. Refer to Structural Drawings for location of rebar positioners at interior 16 inch concrete masonry units.

END OF SECTION

SECTION 042001
UNIT MASONRY AND RELATED MATERIALS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete masonry units (CMU).
   2. Joint reinforcement, anchorage, and accessories.
   3. Reinforcing bars and deformed bar anchors in unit masonry.
   4. Installation of anchor bolts and other embedments in unit masonry.

B. Related Sections:
   1. Section 033000 - Cast-in-Place Concrete.
   2. Section 051200 - Structural Steel: Items to be built in masonry work.
   3. Section 055000 - Metal Fabrications: Items to be built in masonry work.
   4. Section 079000 - Joint Protection: Sealants for expansion/contraction joints.
   5. Section 142123 – Electric Traction Elevators: Items to be built in masonry Work.

1.2 REFERENCES

A. ANSI A41.1 - Building Code Requirements for Masonry.

B. ACI 530.1/ASCE 6 - Specifications for Masonry Structures.

1.3 SUBMITTALS

A. Product Data and Test Reports: Submit manufacturer's recommendations, product data and test reports in accordance with this section and Section 013300.

B. Samples: Submit samples of face brick unit masonry for color verification and appearance acceptance.

1.4 QUALITY ASSURANCE

A. Reference Standards: Comply with requirements of listed standards unless indicated otherwise.

B. Fire Rated Masonry: Whenever fire-resistance classification is shown or scheduled for unit masonry construction, comply with requirements for materials and installation established by governing authorities for construction shown.

C. Test Data: Provide evidence and test data confirming that concrete block and brick conform to standards.

D. Mortar Mixes: Comply with ASTM C270. Mortar for exterior use and for load bearing masonry shall conform to Table 2 property specification requirements. Mortar for other uses may be proportion specification or property specification at Contractor's option.

E. Testing of mortar mix will be performed by testing laboratory and approved by Architect, in accordance with Section 014500.
   1. Tests paid for by Owner.
   2. Tests paid for by Contractor.

F. Submit proposed mortar mix design in accordance with ASTM C270 to testing laboratory for approval prior to commencement of work. Use representative samples of mortar materials and proportions to be utilized in construction.

G. Preconstruction Testing of Mortar Mix
   1. Perform testing of mortar mix to ensure conformance with requirements stated herein and to ensure mortar will not produce efflorescence.
   2. Bond Strength Test: As recommended by testing laboratory, adjust face brick mortar proportions by volume to achieve minimum bond strength of 20 psi.

3. Progress Tests: Provide two 3 inch by 6 inch mortar cylinders on first 10,000 masonry units laid or first 2 weeks of masonry work, whichever occurs first. Thereafter, if tests are acceptable, provide 2 test cylinders for each 50,000 masonry units or every 4 weeks, whichever occurs first. For each series, test mortar samples in accordance with ASTM C780 for compressive strength.
4. If mortar mix does not conform with requirements stated herein, re-establish and resubmit for further testing. Costs for required retesting paid by Contractor.

H. Preconstruction Testing of Concrete Masonry Units:
1. Tentative Acceptance: For tentative acceptance of blocks (or brick) provide tests and reports on minimum of 5 units, from current stock, to provide proof of ability to conform to ASTM Standards. Texture, dimension, tolerance, appearance and test reports will be basis for tentative acceptance of supplier of blocks. Provide samples to Architect for appearance approval.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degree F prior to, during and 48 hours after completion of masonry work.

B. Do not use metal reinforcing or ties having loose rust or other coatings including ice, which will reduce or destroy bond.

C. During freezing or near freezing weather, provide adequate equipment or cover to maintain minimum temperature of 50 degree F and to protect masonry work completed or in progress. Conform to other requirements stated in Division 1.

D. Frozen Materials: Do not use frozen materials or materials mixed or coated with ice or frost. For masonry which is to be wetted, comply with BIA recommendations. Remove and replace masonry work damaged by freezing.

1.6 PROTECTION

A. Maintain protective boards at exposed external corners which may be damaged by construction activities. Provide such protection without damaging completed work.

B. Keep cavities and expansion and expansion-contraction joint voids clear of mortar.

C. Provide temporary bracing during masonry erection. Maintain in place until building structure provides permanent bracing.

D. Protect block walls from excessive moisture after laying. Cover tops of walls when work is not in progress.

E. Heat materials and provide temporary protection of completed portions of masonry work. Comply with governing codes and with "Construction and Protection Recommendations for Cold Weather Masonry Construction" of Technical Notes or Brick and Tile Construction by Brick Institute of America (BIA). Extend covering at least 2 feet down both sides of walls and hold securely in place.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Concrete Blocks: Modular size, load bearing, ASTM C90.
1. (CMU-1) Normal weight Class 1: C33 Aggregate. Unless concrete block is indicated as "light weight block", provide normal weight concrete block.
a. Size:
1) Nominal, as indicated.

B. Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, unless indicated as bullnose.

C. Curing: Kiln and air cured under cover until age of blocks is at least 45 days. Autoclave cured type block may be used.

D. Appearance Requirements: Units shall be light in color, with uniform fine texture, free of face smears.
   1. Broken units shall not be used and chipped or other defective units will not be acceptable or used where exposed. Not over 5 percent of units will be permitted to have chips and chips shall not exceed 3/8 inch in any dimension.
   2. Exposed concrete masonry unit walls shall have units uniform in size, texture and color. Architect reserves right to reject unit masonry manufacturer if, in Architect's opinion, unit quality, color or texture is unacceptable with design intent.
   3. Appearance requirements may be waived by Architect (at their option) for concealed units.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150, Type I, non-staining without air-entrainment, and of natural color. Use Type III high early strength for laying masonry in cold weather.
   1. Use same brand of cement, lime and aggregate throughout project to insure uniform mortar colors.

B. Masonry Cement: Masonry cement not allowed.

C. Aggregates: ASTM C144 and C404.

D. Hydrated Lime: ASTM C207 Type S, without air-entrainment.

E. Premix Mortar: Commercially prepared premix of low alkali Portland cement, hydrated lime, and aggregates; ASTM C387; mortar Type M, S, N.
   1. Optional Mortar Cement (in lieu of Portland Cement and Lime); Lafarge Mortar Cement complying with Uniform Building Code for Mortar Cement. Use at Contractor's option.

F. Water: Potable.

2.3 MASONRY GROUT

A. Provide pea-gravel concrete conforming to ASTM C476, to fill bond beams, concrete unit masonry cells containing vertical reinforcing bars, and other cells or cavities where indicated.

B. Minimum compressive strength of grout shall be 3000 pounds per square inch at 28 days of age. Make, cure and determine strength of grout test prisms in accordance with ASTM C1019.

C. Add sufficient water to produce mix of suitable consistency for pouring without segregation. Slump range: 8 inches to 11 inches.

D. Use fine aggregate size No. 2 and coarse aggregate size No. 8 in accordance with ASTM C404.

2.4 REINFORCEMENT AND ANCHORAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Heckman Building Products.
   2. Dur-O-Wal Incorporated.
   3. Hohmann and Barnard Incorporated.
   4. AA Wire Products Co.

B. Deformed Reinforcing Bars for Wall Reinforcing: Steel Reinforcing Bars at Concrete Unit Masonry; ASTM A615, Grade 60, or comply with Section 032000.

C. (HORIZ REINF-1) Horizontal Reinforcing at Concrete Unit Masonry: Continuous Wire Joint Reinforcing with 9 gauge side rods and crossrods.
   1. Use hot dipped galvanized wire ASTM A 153, Class B-2 (1.5 oz. PSF) for exterior masonry walls.
   2. Use mill galvanized wire ASTM A641. Class 1 (0.40 minimum zinc coating) for interior masonry walls.
   3. Use prefabricated corners and tees at wall intersections.
   4. Acceptable Manufacturers:

a. Dur-O-Wal: Truss-type D/A 310.
b. Comparable product of other specified manufacturers.

D. Steel Wire Rods at Masonry Joints: ASTM A82. Use galvanized wire at exterior masonry walls.
1. Use mill galvanized wire Class 3 (0.8 oz. minimum zinc coating) for exterior masonry walls.

2.5 JOINT FILLER, DEFLECTION MATERIAL AND COLUMN WRAP

A. (MA-1) Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
1. Product and Manufacturer: RS Series Rubber Control Joints by Hohmann and Barnard, Inc..

B. (MA-2) Deflection Material: Pre-molded compressible filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or urethane.
1. Product and Manufacturer: NS Closed Cell Neoprene Sponge by Hohmann and Barnard, Inc..

C. (MA-3) Column Wrap: ASTM D 1056, Grade 2B1, Closed cell foam, 1/4 inch thick.

D. (MA-4) Control Joint Bond Breaker:
1. Type: 6 mil thick polyethylene film.
2. Type: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.6 MORTAR MIX

A. Comply with ASTM C270 and IBC Section 2103 for measurement of mortar materials, mixing of mortar and proportion specifications.

B. Use Type N mortar for all unit masonry work, except use Type S mortar which is to receive color additive and for mortar at unit masonry in contact with earth.

C. Thoroughly mix mortar ingredients, in quantities needed for immediate use.

D. Add mortar color and admixtures in accordance with manufacturer's recommendations. Ensure uniformity of mix and colorations.
1. Consult with and follow manufacturer's directions on: Use, quantity and mixing of admixtures; various conditions affecting mixing and pouring; mix designs and procedures. Show proposed admixtures on mix designs and do not use unless shown.

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

F. Use mortar within 2 hours of mixing at temperatures over 80 degrees F, and 2-1/2 hours at temperatures under 50 degrees F.

G. If necessary, retemper mortar within 2 hours of mixing to replace water lost by evaporation. Do not retemper mortar after 2 hours of mixing.

2.7 UNIT MASONRY PATCHING MATERIALS

A. Masonry materials and workmanship for remodeling and patching at existing masonry work shall match existing.

PART 3 EXECUTION

3.1 PREPARATION

A. Ensure items built-in by other trades for this work are properly located and sized. Fill in solidly with masonry around built-in items. Fill space between hollow metal frames and masonry solidly with mortar.

B. Establish lines, levels and coursing. Protect from disturbances.

3.2 CONCRETE BLOCK INSTALLATION

A. Place masonry in accordance with lines and levels indicated on drawings. Lay from exposed side, plumb, level and true to modular dimensions.

B. Fully bond external and internal corners.

C. Install joint reinforcing, anchors and ties in full mortar surround and where necessary fill voids in blocks to provide full bed to completely imbed items.

D. Keep concrete block and brick dry, under cover and lay only clean, dry undamaged units. Do not lay units with moisture content over 40 percent.

E. Lay hollow concrete masonry units with full mortar coverage on vertical face shells. Bed webs in mortar in starting course.

F. Lay solid masonry units with completely filled bed and head joint, except at expansion and control joints. Butter ends with sufficient mortar to fill head joints and shove into place.
   1. Do not slush head joints.
   2. Bevel rear of bed joint at cavity to exclude mortar from protruding into cavity.

G. Isolate masonry partitions from vertical structural framing members with control joint, with mortar raked back 1/4 inch regardless of joint treatment.

H. Do not shift or tap masonry after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.

I. Ensure masonry courses are of uniform height. Make vertical and horizontal joints equal and of uniform thickness. in full bed of mortar, properly jointed with other work.

J. Remove excess mortar and projections. Take care to prevent breaking masonry corners. Do not let mortar fall into cavity air space, clean out promptly.

K. Perform job site cutting of masonry with proper power tools to provide straight and true, unchipped edges.

L. Lay exposed concrete block in running bond with vertical joint in each course centered on units in course above and below.

M. Where piping and conduit run in masonry, work with other trades to coordinate work. Cut out center bridges in block to create voids for pipes or conduit. Where pipes or conduit exit from wall, drill neat holes to provide neat unpatched walls.

N. Build inner wythe ahead of outer wythe to receive insulation or vapor retarder adhesive.

O. Mortar joints, that will be covered by earth, shall be struck flush and then tooled to dense sealed surface.

P. Tool exposed joints slightly concave to dense smooth surface without overlaps from horizontal to vertical joints. Tool exposed mortar when thumbprint hard. Joints behind ceramic tile shall be flush. Rake out mortar in preparation for application of sealants, where required.

3.3 TOLERANCES

A. Maximum variation from masonry unit to adjacent masonry unit is 1/16 inch.

B. Maximum variation from vertical and horizontal building lines is 1/4 inch in 10 feet.

C. Maximum variation from cross sectional thickness of cavity and composite walls is plus or minus 1/4 inch.

D. Maintain flush face on exposed masonry surfaces.

E. Lay concrete block to receive thinset ceramic tile plumb, with flush mortar joints and with maximum surface variation of 1/8 inch, in 10 feet.

3.4 REINFORCEMENT AND ANCHORAGES

A. Place masonry reinforcing and anchorages for unit masonry as indicated on drawings. If not indicated locate reinforcing as follows:

1. 16 inches o.c. vertical dimensions, continuous full length of wall.
2. At bed joint at top course of wall or partition, continuous full length of wall.
3. In first and second courses below and above each wall opening, extending at least 3 feet beyond opening jamb, in addition to continuous reinforcing noted under #1 above.
4. At foundation walls with earth both sides, provide only at top 2 courses.
5. At composite walls, without cavity, provide extended type reinforcing, full width (less one inch each side) of block and brick wythe.
6. Fully reinforce corners and intersections.
7. Lap masonry reinforcing splices minimum 6 inches.
8. Thoroughly embed wall ties for face brick.
9. Ensure that anchorage embedded in concrete, attached to structural steel members for concrete block are properly placed. Embed free end of anchorage in every second concrete block joint.
10. Reinforce walls, except clay face brick wythe with continuous horizontal joint reinforcing and masonry ties. Fully embed longitudinal side rods in mortar for entire length with minimum cover of 5/8 inch on exterior side of walls and 1/2 inch at other locations.
11. Secure face brick to concrete back-up with dovetail anchors placed at 24 inches on center vertically. Lock into anchor slots. Ensure anchor slots have been properly set in concrete back-up at 24 inches on center horizontally. Provide additional anchors within 12 inches of openings.

3.5 MASONRY GROUTING

A. Place grout at intervals not to exceed 4 feet of wall height during construction of walls, unless cleanouts are provided in which case 8 foot lifts may be used.

B. Rod or vibrate grout to insure complete filling of cells.

C. Allow at least 15 minutes between successive pour lifts to permit settlement.

D. Stop intermediate pours at least 1-1/2 inches below mortar joint.

E. Exercise care during filling of cells to insure reinforcement is properly positioned. Tie vertical bars to joint reinforcing at 32 inches centers to maintain their proper location.

F. Use care to prevent mortar droppings from accumulating at base of cells. Provide temporary cleanout openings, if necessary, at base of cells in order to remove droppings prior to placement of grout.

3.6 BOND BEAMS AND LINTELS

A. Provide reinforced concrete block lintels over openings where indicated on drawings.

B. Construct lintels and bond beams using concrete and reinforcing steel. Maintain minimum 6 inch bearing on each side of openings. Erect on full even beds of mortar with minimum 3 courses of solid brick or one course filled- core hollow units under lintels and beams.

C. Construct lintels using PCA recommendations, with reinforcing bars of size indicated. Bars to project 1/2 inch at lintel ends.

D. Use reinforcing bars of full lengths only.

E. Place and consolidate concrete without disturbing reinforcing. Construct lintels on plank, adequately supported, joints equally spaced. Fill spaces around built-in items solid with masonry and mortar unless otherwise indicated. Clean out spaces prior to pouring concrete fill.

F. Allow lintels to reach maximum strength before removing temporary supports. Installation shall be minimum 2 weeks old before used to carry load. Remove units that show evidence of cracking.

3.7 JOINT FILLERS AND DEFLECTION MATERIAL

A. Install fillers in accordance with manufacturer's printed instructions. Compressible fillers shall be 50 percent larger than joint size.

B. Set units at proper depth or position in joint to coordinate with other work, including installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units. Recess exposed edges or faces or compressible fillers slightly behind adjoining surfaces so that compressed units will not protrude from joint.

3.8 CONTROL JOINTS AND CONSTRUCTION JOINTS

A. Provide control joints in brick and block work as indicated and where shown on drawings.

B. Do not continue masonry reinforcing across joints.

C. Form joints in brick work, straight and true.

3.9 BUILT-IN WORK

A. As work progresses, build-in items as indicated and required, including, hollow metal frames, window frames, steel angle lintels, nailing strips, anchor bolts, plates, sleeves, hangers, supports, and other items supplied by other trades.

1. Wherever bolts, brackets and similar anchor items are cast-in masonry, fill voids in masonry with mortar to adequately anchor and transmit loads.

B. Build-in items plumb and true.

C. Bed anchors of hollow metal frames in mortar joints. Fill frame voids solid with mortar. Fill masonry cores at jambs with grout for full projection at frame anchors.

D. Do not build-in organic materials which will be subjected to rot or deterioration.

3.10 CUTTING AND FITTING

A. Cut and fit concrete block for chases, pipes, conduit, sleeves, and grounds. Cooperate with other sections of work to ensure correct size, shape and location. Provide not less than 8 inches of masonry between chase or recess and jamb of openings. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges.

B. Obtain Architect's review prior to cutting or fitting any area not indicated on drawings, or which may impair appearance or strength of masonry work.

3.11 INTERIOR PARTITIONS

A. General: Carry masonry partitions up to structure above, unless otherwise noted.

B. Openings Through Walls: Except as otherwise indicated, where piping, conduit or similar features pass through walls, carefully fill spaces to block sound. Fill voids to permit movement and deflection. Fill solid around obstructions and voids to form effective closures.

C. Joint to Structure Above: Provide 3/8 inch joint between masonry and over- structure and pack solidly with Shok-Pak to form dense and effective barrier to sound transmission. Filling of voids shall permit movement and deflection. Fill solid around obstructions and voids to form effective closure.

3.12 FIELD QUALITY CONTROL - LEVEL 1 NONESSENTIAL FACILITIES

A. Coordinate with independent testing and inspecting agency engaged by the Owner to perform field quality control inspection and testing.

1. Provide necessary scaffolding or temporary platforms required by testing agency in order to perform their work. Such scaffolding or platforms shall comply with safety regulations and shall be acceptable to testing agency.

B. Inspection of masonry is required during preparation of masonry wall prisms, sampling and placing of masonry units, placement of structural reinforcement, cleanout of grout space immediately prior to closing of elements and during all grouting operations.

C. "Continuous" Inspection of Masonry: Inspections noted below as being continuous shall be performed uninterrupted each day while the specific task is being performed.

1. Continuous inspection shall be provided for 100% of shear walls, masonry beams and masonry columns.

D. "Periodic" inspection of masonry: Inspection items noted below as being periodic shall be performed at least once per 1,000 square feet of surface but not less than once per week.

E. Samples and Tests for Special Inspections: (Technical II)
   1. Construction Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof, but not less than one set for the project.
      a. One set shall consist of testing three samples.
   2. Masonry Unit Tests – Perform in accordance with IBC Chapter 21.
      a. For each type of unit provided, verify units conform to strength, absorption, and unit weight requirements of ASTM C 55 or ASTM C 90 when tested in accordance with ASTM C 140.
      b. Provide units which match accepted samples as to texture and general character. Appearance will be an element considered for conformance. Contractor must arrange for tests and for delivery to laboratory.
   3. Mortar Tests for Unit Masonry Complying with ASTM C270 Proportion Specifications:
      a. For each mix provided, test mortar for initial consistency and board life, mortar aggregate ratio, and mortar air content in accordance with ASTM C 780.
   4. Mortar Tests for Unit Masonry Complying with ASTM C270 Property Specifications:
   5. Flexural Bond Strength Testing:
      a. For each type of construction provided at the following applications, test mortar for flexural bond strength in accordance with ASTM E 518 or ASTM C 1072.
         1) Below grade masonry basement walls or retaining walls in contact with earth.
         2) Exposed exterior, above grade, load-bearing and non-load-bearing walls, and parapet walls.
   6. Grout Testing for each mix provided:
      a. Test grout for temperature in accordance with ASTM C 1064.
      b. Test grout for slump in accordance with ASTM C 143.
      c. Test grout for strength in accordance with ASTM C 1019. For each 50 cu yds placed or each day's work, whichever is less, make 3 grout samples and test one sample at 7 days and remaining 2 at 28 days.

F. Masonry Preparation and Placement (Technical II)
   1. Base Conditions: On a periodic basis, verify that masonry bearing surfaces are clean.
   2. Condition of Units: On a periodic basis, verify that masonry units are clean, sound and dry.
   3. Proportions of site prepared mortar: On a periodic basis, verify proportions of prepared mortar are consistent with previously submitted materials.
   4. Placement: On a periodic basis, inspect laying of masonry units for the following: nominal unit widths, stack or running bond, proper thickness and tooling of mortar joints, acceptable depth of furrowing of bed joints. Note temperature at time of inspection.
   5. Joints: On a periodic basis, inspect construction, expansion and contraction joints for location and continuity of steel.
   6. On a periodic basis, verify hot and cold weather procedures are followed.
   7. On a periodic basis, verify wall cavities are protected against entry of precipitation.

G. Masonry Reinforcement (Structural I)
   1. Vertical Reinforcement: On a periodic basis, inspect placement and alignment of vertical bars and dowels for size, grade and spacing. Inspect length of lap splices, clearances between bars, clearances to masonry units and outside face of walls and positioning of steel.
   2. Horizontal Reinforcement: On a periodic basis, inspect horizontal joint reinforcement (HJR) steel and masonry reinforcement bars for size, length of lap splices, dowels, clearances between bars, clearance to masonry units and outside face of walls and alignment.
   3. Ties: On a periodic basis, inspect ties in masonry for type, straightness, embedment, spacing and size.
   4. Dowels and Anchors: On a periodic basis, inspect the installation of masonry anchor bolts, joist anchors, inserts, straps and dowels.

H. Prior to Masonry Grouting and Capping (Technical II)
   1. Grout Spaces: On a periodic basis, verify that grout spaces are correctly sized and clean, cleanouts are closed after inspection and grout barriers are in place before grouting.

2. Reinforcement: On a periodic basis, verify placement of reinforcement and connectors remains consistent with Contract Documents.
3. Site Prepared Grout: On a periodic basis, verify proportions of site prepared grout are consistent with previously submitted materials.

I. During Grout Placement (Technical II)

1. Grouting:
   a. Continuously observe proper grouting technique including consolidation to approved height of grout space, cleanouts, rebar positioning, reconsolidation and vibration.
   b. Grout Specimens: Observe 100% of preparation of all required grout specimens, mortar specimens, and/or prisms to be tested.
2. Dry Packing: On a periodic basis, verify proper application of dry packing.

3.13 CLEANING

A. Wipe off excess mortar as work progresses. Dry brush at end of each days work. Remove excess mortar and smears upon completion of masonry work.

B. Point or replace defective mortar. Match adjacent work.

C. After mortar is thoroughly set and cured, clean exposed surfaces with masonry cleaner in accordance with cleaner manufacturer's printed instructions. Use nonmetallic tools in cleaning operations.

D. Clean brick masonry in accordance with BIA Technical Notes on Brick Construction, 20 Revised 11, November 1990.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel framing, steel lintels, shelf angles, embedded plates, open web joist bearing plates, steel beam bearing plates, slide bearings at expansion joints, roof opening frames, mechanical equipment support frames and other items defined as structural steel.
2. Shear stud connectors, deformed bar anchors, anchor rods, expansion bolts and other incidental items of structural steel required to be built into concrete or masonry and attached to the structural frame.
3. Shop priming of structural steel.
4. Erection of structural steel.
5. Welding of reinforcing supplied by Section 032000 “Concrete Reinforcing”.
6. Grout below steel bearing and base plates.
7. Engineering analysis and design of structural steel connections.

B. Related Sections:

1. Section 014500 "Quality Control" for independent testing agency procedures and administrative requirements.
2. Section 014533 “Structural Testing and Special Inspections.”
3. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
4. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
5. Section 055000 "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
6. Section 055100 "Metal Stairs."
7. Section 078123 “Intumescent Mastic Fireproofing” for surface-preparation and priming requirements at intumescent mastic fireproofing.
8. Section 099600 "High-Performance Coatings" for surface-preparation and priming requirements at high-performance coatings.

1.2 REFERENCES

A. AISC 303: Code of Standard Practice for Steel Buildings and Bridges.

B. AISC 341: Seismic Provisions for Structural Steel Buildings.

C. AISC 360: Specification for Structural Steel Buildings.

D. AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts.

E. AWS D1.1: Structural Welding Code - Steel.

F. AWS D1.4: Structural Welding Code - Reinforcing Steel.

G. SSPC: The Society for Protective Coatings.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Architecturally Exposed Structural Steel: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.

C. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

D. Heavy Sections: Rolled and built-up sections as follows:

1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
2. Welded built-up members with plates thicker than 2 inches.
3. Column base plates thicker than 2 inches.

E. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

F. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be designed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.

1. Design connections using schematic details indicated and AISC 360.
2. Use [**LRFD; data are given at factored-load level**] [**ASD; data are given at service-load level**].

1.5 ACTION SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Submit fabrication and erection drawings in accordance with Section 013300. Show fabrication of structural-steel components. Before preparation of shop drawings and fabrication of materials affected by existing construction, field verify existing elevations, dimensions and conditions as shown on Contract Documents and report discrepancies to Architect for resolution. Submit all relevant drawings together so that review can be complete.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Indicate items to be galvanized, where required.
6. Identify members and connections of the seismic-load-resisting system.
7. Indicate locations and dimensions of protected zones.
8. Identify demand critical welds.
9. For connections indicated to be designed by structural-steel fabricator, submit calculations signed and sealed by the qualified professional engineer responsible for their preparation.
    a. Submit connection design calculations at least 2 weeks prior to submission of shop drawings for connections.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1, "Structural Welding Code - Steel," for each welded joint qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Mill test reports for structural steel, including chemical and physical properties.

C. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.
   6. Nonshrink grout.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A fabricator experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
   1. Fabricator shall participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: An experienced installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
   1. Installer shall participate in the AISC Quality Certification Program and be designated an AISC-Certified Erector, Category [**ACSE**] [**CSE**].

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement [**P1**] [**P2**] [**P3**] or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."
   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

F. Comply with applicable provisions of the following specifications and documents:
   1. AISC 303.
   2. AISC 341 and AISC 341s1.
   3. AISC 360.
   4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Section 014533.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work.

B. Deliver anchor rods and anchorage devices to be embedded in cast-in-place concrete or masonry in ample time so as to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

D. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Only new and factory lubricated fasteners shall be used on the project. Fasteners that have become dry or rusty are not permitted.

E. Store welding electrodes in hermetically sealed containers. Electrodes exposed to the atmosphere for periods greater than those permitted shall be redried in accordance with AWS D1.1.

1.9 STRUCTURAL STEEL TO RECEIVE SFRM

A. Provide structural steel substrate to receive sprayed fire-resistive materials free of paint, lubricants, oils, dirt or other contaminants which would significantly impair adhesion of sprayed materials.

1.10 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [**25**] [**50**] <**Insert number**> percent.

B. W-Shapes (and WT cut from W-shapes): ASTM A 992.

C. Channels, Angles and Miscellaneous Shapes: ASTM A 36.

D. Plate and Bar: ASTM A 36, unless otherwise indicated.
1. ASTM A 572, Grade 50 at moment connection plates and where indicated.

E. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588, Grade 50.

F. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

G. Steel Pipe: ASTM A 53, Type E or S, Grade B.

H. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts or ASTM F 1852 tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or ASTM F 2280 tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

D. Anchor Rods: [**ASTM F 1554, Grade 36**] [**ASTM F 1554, Grade 55, weldable**]
1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.

E. Threaded Rods: ASTM A 36.
   1. Nuts: ASTM A 563 heavy-hex carbon steel.
   2. Washers: ASTM A 36 carbon steel.

F. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A.
   1. Nuts: ASTM A 563 heavy-hex carbon steel.
   2. Washers: ASTM A 36 carbon steel.

G. Deformed Bar Anchors: ASTM A 496, cold-finished carbon steel.

H. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

J. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

K. Hot Dip Galvanizing for Bolts and Similar Threaded Fasteners: ASTM A153.

L. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Amscot Structural Products Corp.
      b. Fluorocarbon Company Limited.
      c. R.J. Watson Bridge & Structural Engineered Systems.
      d. Tobi Engineering.
      e. Seismic Energy Products, L.P.
      f. Voss Engineering.
   2. Total Movement Capability: [**2 inches**] <Insert value>.

2.3 PRIMER

A. Shop-Applied Primer for Steel to Receive High-Performance Coating (HPC): Coordinate with Section 099600 - High-Performance Coatings.

B. Shop-Applied Primer for Steel to Receive Paint (PT) or Epoxy Paint (PTE): Coordinate with Section 099000 - Painting.

C. Primer for Steel to Receive Intumescent Mastic Fireproofing: Comply with Section 078123 “Intumescent Mastic Fireproofing.”

D. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

E. Galvanizing Repair Paint: ASTM A 780.

F. Coating for Steel in Contact with Earth: 3M Skotchkote 306, liquid epoxy, or approved equal.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with reviewed shop drawings, AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
   1. Camber structural-steel members where indicated.
   2. Fabricate beams with rolling camber up.
   3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
   4. Mark and match-mark materials for field assembly.

5. Clip angles, headed shear connectors or other components shown welded to top flanges of beams, except for end connections, shall be shipped loose for attachment in field.
6. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
   1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning" or SSPC-SP 2, "Hand Tool Cleaning".

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

H. Where lintel and soffit plates are indicated with edge flush with masonry, horizontal leg shall either terminate 1/4 inch short of masonry at jambs, or be notched at end extending into masonry to permit mortar joints across face. At beam and plate lintels spanning from jamb to jamb of opening, stop plate short of masonry. Where bearing of horizontal leg is required at opening jamb, notch lintel end to permit full 3/4 inch of mortar cover along face.

I. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

J. Fabricate Architecturally Exposed Structural Steel (AESS) with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.
   1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
   2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for Architecturally Exposed Structural Steel.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

B. Weld Connections: Comply with AWS D1.1[**and AWS D1.8**] for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

C. Architecturally Exposed Structural Steel (AESS): Verify that weld sizes, fabrication sequence, and equipment used will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 3/8 and larger. Grind flush butt welds. Dress exposed welds.

2.7 SHOP PRIMING

A. Shop prime steel surfaces unless otherwise noted. Do not shop prime the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. [**Do not**] shop prime steel surfaces concealed by interior building finish.

C. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
4. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   a. Provide at exposed structural steel surfaces.

D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

E. Priming at High-Performance Coatings: Comply with Section 099600 "High-Performance Coatings."
1. Surface preparation: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Apply shop primer in accordance with High-Performance Coating manufacturer's instructions after surface preparation in compliance with primer manufacturer's requirements. Maintain minimum coverage at joints, corners, edges and exposed surfaces.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.

2.9 SOURCE QUALITY CONTROL

A. Testing and Inspection: Owner will engage qualified special inspectors in accordance with Section 014533.
1. Qualifications: The minimum category of special inspector required to perform services outlined below are noted by qualifications in parentheses. The definitions of the categories of special inspector are included in Section 014533.

B. Coordinate with Independent Testing and Inspecting Agency employed by the Owner to perform shop quality control inspection and testing listed below:
1. High Strength Bolting (Technical II):
   a. Preparation: Visually inspect mating surfaces and bolt type for all slip-critical bolted connections for general conformance with the Contract Documents prior to bolting.
   b. Slip Critical Bolts and Tension Bolts: Test bolt tightening in 10 percent of bolts. Test minimum of 2 bolts in each connection. Verify that all plies of connected elements have been brought into contact, at 100 percent of connections. Verify all tips are removed from all twist-off bolts.
   c. Bearing Bolts: Visually inspect to confirm all plies of connected elements have been brought into contact, at 100 percent of connections. (Applies only to bolts designed for values not requiring exclusion of threads from failure plane, other bolts require testing for tension bolts.)
2. Welding (Technical II):
   a. Fillet Welds: Visually inspect 100 percent of all fillet welds for size, length and quality, per AWS D1.1.

b. Partial Penetration Welds: Test 100 percent of all partial penetration welds 5/16 inch and larger, using Ultrasonic Testing per AWS D1.1, Section 6. Test 25 percent of all partial penetration welds less than 5/16 inch, using Magnetic Particle Testing per ASTM E109, performed on root pass and on finished weld.
c. Full Penetration Welds: Test 100 percent of full penetration welds 5/16 inch and larger, using Ultrasonic Testing per AWS, D1.1 Section 6. Test 25 percent of full penetration welds less than 5/16 inch, using Magnetic Particle Testing per ASTM E-109, performed on root pass and on finished weld.

C. Fabricator Certification: Testing of high strength bolting, fillet welds and partial penetration welds will be waived if fabrication shop participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is approved by the Authorities Having Jurisdiction and the Structural Engineer of Record.
1. Testing requirements will be reinstated if work is considered questionable through visual observation of testing agency.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
1. Maintain erection tolerances of Architecturally Exposed Structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Structural Engineer of Record. Finish thermally cut sections within smoothness limits in AWS D1.1.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Remove erection bolts on welded, Architecturally Exposed Structural Steel; fill holes with plug welds; and grind smooth at exposed surfaces.

I. Do not field cut openings through structural steel members for passage of conduit, pipes, or ducts without obtaining written permission from Structural Engineer of Record. Wherever permission is given, provide openings and additionally reinforce member as directed by Structural Engineer of Record.

J. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" and as indicated below for type of bolt and type of joint specified. If Twist-Off Tension-Control Bolts or Direct-Tension-Indicators are used, bolt assemblies shall be installed following recommendations of the manufacturer, and the following minimum requirements.
   1. ASTM F 436, hardened carbon-steel washers shall be used at the following locations:
      a. To cover over-sized and slotted holes.
      b. Beveled washer at joint face with a slope greater than 1:20.
      c. Below the nut of a Twist-Off Tension-Control Bolt Assembly for Pretensioned, Slip-Critical and Bearing Joints when the spline is intended to be severed.
      d. Below the turned element when using a Calibrated Wrench Pretensioning method for Pretensioned and Slip-Critical Joints.
      e. At Pretensioned and Slip-Critical Joints with ASTM A490 bolts, under the bolt head or nut when bearing against connected material with a specified minimum yield strength less than 40 ksi.
   2. For Pretensioned and Slip-Critical Joints, assemblies shall be initially installed as a Snug-tightened joint. For Slip-Critical Joints with Tension-Control Bolt assemblies, the initial Snug-tightened joint shall also be accomplished without severing the splined end. If a splined end is severed during this operation the bolt assembly shall be removed and replaced.
   3. Snug-tightened condition shall bring the connected plies into firm contact. Compacting the joint to a snug-tight condition shall progress systematically from the most rigid part of the joint. Subsequent bolt tightening shall also progress systematically from the most rigid part of the joint.
   4. Fastener components shall be protected from dirt and moisture in closed containers at the site of installation. Only as many fastener components as are anticipated to be installed during the work shift shall be taken from protected storage. Fastener components that are not incorporated into the work shall be returned to protected storage at the end of the work shift. Fastener components shall not be cleaned or modified from the as-delivered condition. Bolt assemblies that accumulate rust or dirt shall not be incorporated into the work.
   5. A Tension calibrator shall be available on the site to test randomly three complete fastener assemblies of each diameter and grade to be used in the work for Pretensioned and Slip-Critical Joints at the beginning of each day. The Tension calibrator shall be provided by the Erector, and the test administered by the Project Inspector or Inspector’s representative.

B. Weld Connections: Comply with AWS D1.1[**and AWS D1.8**] for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Verify that weld sizes, fabrication sequence, and equipment used for Architecturally Exposed Structural Steel will limit distortions to allowable tolerances. Prevent surface bleeding of backside welding on exposed steel surfaces. Grind smooth exposed fillet welds 3/8 inch and larger. Grind flush butt welds. Dress exposed welds.
   3. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
   4. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage qualified special inspectors in accordance with Section 014533.
   1. Qualifications: The minimum category of special inspector required to perform services outlined below are noted by qualifications in parentheses. The definitions of the categories of special inspector are included in Section 014533.

B. Provide necessary scaffolding or temporary platforms required by the special inspectors in order to perform their work. Such scaffolding or platforms shall comply with safety regulations and shall be acceptable to the special inspectors.

C. Coordinate with independent testing and inspecting agency engaged by the Owner to perform field quality control inspection and testing.
   1. Provide necessary scaffolding or temporary platforms required by testing agency in order to perform their work. Such scaffolding or platforms shall comply with safety regulations and shall be acceptable to testing agency.

D. High Strength Bolting (Technical II):
   1. Review with Testing Agency requirements and demonstrate method to be used for tightening of bolts to comply with ASTM specifications.
   2. Where power wrenches or manual torque wrenches are to be used, Testing Agency shall approve procedures for calibration of wrenches and installation of bolts.
   3. Enable Testing Agency to observe field installations of bolts to verify that approved procedures are being followed for bearing-type connections and that plies of connected elements have been brought into snug contact.
   4. For bolts in slip-critical connections, allow verification by Testing Agency that bolts in completed connections have been tightened to required tensions.
      a. Preparation: Visually inspect mating surfaces and bolt type for all slip-critical bolted connections for general conformance with the Contract Documents prior to bolting.
      b. Verify that all plies of connected elements have been brought into contact, at 100% of connections
      c. Test High Strength bolted connections per RCSC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts," and IBC Chapter 17.
      d. Test minimum of 1 bolt at connections consisting of 10 bolts or less. Test minimum of 2 bolts, but not less than 10 percent, at connections with more than 10 bolts.
      e. If one or more bolts in connection is below required minimum tension, all bolts in that connection shall be tested, or re-tightened and tested again, until approved by testing laboratory.
      f. At connections using several bolts, return wrench to "touch up" bolts previously tightened to assure that all are tightened to prescribed amount.
      g. Verify all tips are removed from "twist"-off bolts.

E. Welding:

1. Allow Testing Agency to visually inspect field welding of steel members in accordance with Section 6, Inspection of AWS Structural Welding Code. Correct work that is not approved and inspect until welds are acceptable to laboratory. Perform such additional inspecting and work at no additional cost to Owner.
2. Fillet Welds: Visually inspect 100% of all fillet welds, for size, length and quality, per AWS D1.1. (Technical II)
3. Partial Penetration Welds: Test 100% of all partial penetration welds 5/16 inch and larger, using Ultrasonic Testing per AWS D1.1, Section 6. Test 25% of all partial penetration welds less than 5/16 inch, using Magnetic Particle Testing per ASTM E-109, performed on root pass and on finished weld. (Technical II)
4. Full Penetration Welds: Test 100% of all full penetration welds 5/16 inch and larger, using Ultrasonic Testing per AWS D1.1 Section 6. Test 25% of all full penetration welds less than 5/16 inch, using Magnetic Particle Testing per ASTM E-109, performed on root pass and on finished weld. (Technical II)
5. Stud Shear Connector Welds: Remove all ceramic welding ferrules. Visually inspect 100% of installed studs for full 360° flash. Alternatively, sound 100% of installed studs, for full penetration weld, using an 8 lb. maul. Test all questionable studs, not showing full 360° flash by bending studs to 15° from vertical, away from weld discontinuity, per AWS D1.1, Section 7. Randomly test all other studs by bending to 15° from vertical as noted (Technical I):
   a. Studs welded through deck 15%.
   b. Studs welded to bare steel 5%.
6. Miscellaneous Metals, Inserts and Prefabricated Components: Where integrity of the connections impact life safety or performance of the building structure, provide testing and inspection as for typical welds previously specified.
7. Procedures and Preparation (Technical II):
   a. Verify qualifications of all welders as AWS certified.
   b. Verify proposed welding procedures and materials.
   c. Verify adequate preparation of faying surfaces.
   d. Verify preheat and interpass temperatures of steel, proper technique and sequence of welding, and cleaning and number of passes are provided as required

F. Headed Shear Studs (Technical I)
1. Verify stud quantities are as shown on Contract Documents.
2. Verify stud placement layout and spacing requirements are as shown on Contract Documents.

G. Mechanical Fasteners (Misc.) (Technical I)
1. Fasteners: Visually inspect specified size, spacing, embedment and location. See also Specification sections:
   a. 033000 - Cast-In-Place Concrete.
   b. 053100 - Steel Decking.
   c. 054000 - Cold Formed Metal Framing.

H. Structural Configuration (Structural I):
1. Submittals: Verify mill test reports and other submitted documentation, for compliance with Contract Documents.
2. Materials: Verify materials delivered to site comply with Contract Documents and approved shop drawings. (Technical I)
   a. Bolts.
   b. Electrodes.
   c. Mechanical Fasteners.
   d. Deck Gauge.
3. Detail Compatibility: On a periodic basis: (Structural I)
   a. Review project documents affecting integrity of the structure, including Contract Documents and pertinent submittals (approved shop drawings).
   b. Visit site, at intervals appropriate to the stage of construction, to perform review of the structure and visually confirm general compliance with the Contract Documents and pertinent submittals.
   c. Inspect the following to verify member orientation, configuration, type and size comply with details indicated on the Contract Documents and approved shop drawings:
      1) Bracing and stiffening members.

2) Proper applications of joint details at connections for structural members.
3) Other work critical to the integrity of the building structure.

I. Conventional Testing and Inspection Requirements: (Technical II)
   1. High Strength Bolting:
      a. Bolt Material Test: Test a minimum of two bolts of each ASTM grade and diameter specified, for bolt hardness and tensile properties. (SNT-TC-1A).
      b. Fabrication and Erection Tolerances: Verify in-place structure satisfies specified tolerances. (Contractor).

J. If special inspection of fabricator's work is required, testing agency may test and inspect structural steel at plant before shipment. Owner and SER reserve right to reject material not complying with Contract Documents at any time before final acceptance.

K. Definitions:
   1. ASNT - The American Society for Non-destructive Testing.
   2. NDE - Non-destructive Evaluation.
   3. AWS/CAWI - American Welding Society/Certified Associate Weld Inspector.
   4. AWS/CWI - American Welding Society/Certified Weld Inspector.

L. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior steel stud wall systems.
   2. Exterior gypsum sheathing.
   3. Steel furring.

B. Related Sections:
   1. Section 051200 - Structural Steel Framing.
   2. Section 055000 - Metal Fabrications.
   3. Section 061000 - Rough Carpentry: Wood blocking and furring.
   4. Section 072600 - Vapor Retarders
   5. Section 072670 - Moisture Barrier
   6. Section074646 – Mineral-Fiber Cement Siding
   7. Section 092216 - Non-Structural Metal Framing: Metal studs for interior non-load bearing gypsum board partitioning.
   8. Section 092900 - Gypsum Board.
   9. Section 054500 – Metal Support Assemblies.

1.2 DESIGN CRITERIA FOR EXTERIOR WALLS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

B. Performance Requirements: Design cold form framing per the following standard:
   1. AISI “Specifications for Design of Cold-Formed Steel Structural Members”.

C. Designs: Provide in accordance with applicable codes and standards to safely support project dead loads, live loads and lateral wind loads without excessive stress or deflection with following stipulation:
   1. Steel Studs: Depth as required to support project loads and meeting the deflection criteria as specified below.
      a. Minimum Stud Depth: 6 inches unless noted otherwise.
   2. Spacings of Studs: As required to meeting loading requirements but not over 16 inches on center.
   3. Lateral Deflection of Studs Under Design Loading:
      a. Mineral Fiber Cement Siding Backup: Deflection not over L/600 of their unsupported height.
   4. Bridging: Provide for walls that will be unsheathed.
   5. Structural Support Movement: System to accommodate anticipated vertical interstory differential live load deflection of 1/2 inch minimum upward and downward, in addition to anticipated thermal movement.
   6. Sidesway Movement: System to accommodate anticipated interstory differential drift of H/400 in any horizontal direction. Cantilever brick walls to accommodate 2H/500 of their unsupported height.
   7. Suspended metal stud framing systems shall support system dead loads, live loads, and wind loads with adequate attachment to main structure without distortion to the anchorage assembly.

1.3 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Submit in accordance with Section 013300.

1. Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

C. Calculations: Structural design shall be performed by a Professional Engineer, licensed in the state where Project is located, indicating structural integrity of members, anchors, fasteners and connections to building structure, in accordance with specified criteria. Signed engineering calculations shall be submitted to Architect/Engineer upon request.

1. Engineering Responsibility: Calculations shall be reviewed for stated design assumptions, general compliance to specified requirements, and forces imposed on structure. The accuracy of the design calculations shall be the sole responsibility of the Contractor's Professional Engineer.

D. Qualification Data: For firms and persons specified in "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

E. Manufacturers' Instructions:

1. Erection instructions containing sequence of operations and requirements for temporary bracing.

F. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

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

B. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings, and other structural data.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent

D. Inspection and Quality Control: Steel framing manufacturer shall provide qualified representative for periodic on-site review of fabrication and installation in accordance with manufacturer's recommendations.

E. Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel".

F. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide 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.

1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

G. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing.

1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

1.5 DELIVERY AND STORAGE

A. Protect metal framing units from rusting and damage. Deliver to project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off ground in dry ventilated space or protect with suitable waterproof coverings.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. AllSteel & Gypsum Products, Inc.
2. ClarkDeitrich Building Systems, Inc.
3. Consolidated Fabricators Corp.
4. Formetal Co. Inc.
5. MarinoWARE.
6. MBA Building Supplies, Inc.
7. Steel Construction Systems.
8. Steel Network, Inc.
9. Steel Structural Systems.
10. Super Stud Building Products, Inc.
11. United Metal Products, Inc.

2.2 COLD-FORMED STEEL FRAMING

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheet for Cold-Formed Framing Components: ASTM A 1003, Structural Grade 33 Type H (ST33H), with ASTM A 653 G90 zinc coating.

C. (STL STUD-1) Structural Steel Studs: Manufacturer's standard zinc-coated C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch (16 gauge).
2. Web Depth (Minimum): 6 inches, or as shown.
3. Flange Width (Minimum): 1-5/8 inches.

D. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch (16 gauge), or matching steel stud thickness.
2. Flange Width: 1-1/4 inches.

E. (STL FURG-1) Hat Shaped, Rigid Furring Channels:

1. Minimum Base-Metal Thickness: 0.0428 inch (18 gauge).

F. (STL FURG-2) Z-Shaped Furring: With slotted or nonslotted web.

1. Minimum Base-Metal Thickness: 0.0329 inch (20 gauge).
2. Depth: As shown and as required to fit insulation thickness and air space (if applicable).

G. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads, and as follows.

1. Minimum Uncoated-Steel Thickness: 0.0566 inch (16 gauge), unless otherwise indicated or necessary for engineering.
2. Flange Width: Minimum of 2 inches for vertical deflection of 1/2 inch. Provide greater width for greater deflections or use double deflection track.

H. Studs and track receiving anchors for other system components such as window and/or louver attachments shall be of adequate strength and gauge to support the loads of these attachments including prying, pullout, and twisting forces caused by eccentric loading conditions

I. Framing Accessories: Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

J. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.

3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.3 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A 36M, zinc coated by hot-dip process according to ASTM A123.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed, headless, hooked, bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

D. Power-Actuated Fasteners: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load not less than 5 times design load, calculated in accordance with ICC-ES AC 70, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

G. Vertical Deflection Clips: Manufacturer’s standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Dietrich Metal Framing; a Worthington Industries Company.
      b. MarinoWare, a division of Ware Industries.
      c. SCAFCO Corporation
      d. The Steel Network, Inc.

2.4 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and 30-minute working time.

2.5 EXTERIOR GYPSUM SHEATHING

A. (GYP SHTG-1) Glass Face Gypsum Sheathing: High-moisture resistant board with water-resistant silicone or wax treated gypsum core and fiberglass reinforced faces manufactured in accordance with ASTM C1177 specially designed for exterior substrate.
   1. Thickness: ½ inch thick,.
   2. Size: Manufacturer’s standard
   3. Available Manufacturer:
      a. Georgia-Pacific Gypsum: DensGlass Gold Sheathing.
      b. Certainteed: GlasRoc Sheathing.
      c. USG: Securock Glass-Mat Sheathing.
      d. National Gypsum: eXP Extended Exposure Sheathing.

e. Temple-Inland.

B. (GYP SHTG-2) Glass Face Gypsum Sheathing: High-moisture resistant board with water-resistant silicone or wax treated gypsum core and fiberglass reinforced faces manufactured in accordance with ASTM C1177 specially designed for exterior substrate.

1. Thickness: 5/8 inch thick, Type X.
2. Size: Manufacturer's standard
3. Available Manufacturer:
   a. Georgia-Pacific Gypsum: DensGlass Fireguard Sheathing.
   b. Certainteed: GlasRoc Sheathing.
   c. USG: Securock Glass-Mat Sheathing.
   d. National Gypsum: eXP Extended Exposure Sheathing.
   e. Temple-Inland.

2.6 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C1007, unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

F. 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.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

I. 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 and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
   1. Anchor Spacing: As shown on Shop Drawings.

B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
   1. Stud Spacing: 16 inches typically and as indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where wall-framing continuity is interrupted by floor framing. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

F. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

G. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
   1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

H. Install horizontal bridging in stud system, spaced apart at dimension indicated on Shop Drawings. Fasten at each stud intersection.
   1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle.

I. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

K. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Install single deep-leg deflection tracks and anchor to building structure.
   2. Install vertical deflection clips to structure and to studs, one per stud at each floor and roof level.

3.5 GYPSUM SHEATHING INSTALLATION

A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.

B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8 inch setback where non-load-bearing construction abuts structural elements.

C. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.

D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.

E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.

F. Vertical Installation: Install 48 inch wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud at approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

3.6 FIELD QUALITY CONTROL

A. Coordinate with independent testing and inspecting agency engaged by the Owner to perform field quality control inspection and testing.

B. Cold Formed Metal Framing Welds: On a periodic basis, visually inspect 100% of welds for specified length, size and continuity in accordance with AWS D1.3 for metal less than 1/8 inch in thickness, for work designed as a structural element. (Technical I)

C. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

D. Provide access for testing agency to places where cold formed metal framing work is being fabricated or produced so that inspection and testing can be accomplished.

E. Testing agency may inspect cold formed metal framing before shipment; however, Owner's Representative reserves right at any time before final acceptance, to reject material not complying with requirements.

F. Correct deficiencies in work which inspections and test reports have indicated to be not in compliance with requirements when directed in writing by Architect or Owner.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Miscellaneous and ornamental metal, except structural steel framing as specified in Section 051200 and defined as structural steel in AISC "Code of Standard Practice".
   2. Supports, anchorage and accessories for miscellaneous metal and ornamental metal work.
   3. Shop prime paint on ferrous metal.
   4. Steel framing, supports and mounting plates at overhead doors..
   5. Ships ladders.
   6. Metal ladders.
   7. Metal grating.
   8. Bollards.

B. Related Sections:
   1. Section 055100 – Metal Stairs: All steel stair assembly (STAIR-1)
   2. Section 051200 - Structural Steel Framing.
   3. Section 042000 - Unit Masonry.
   4. Section 099000 – Painting: Finish painting.

1.2 REFERENCES

A. AWS D1.1 - Structural Welding Code.

B. SSPC PS7.01 - Steel Structures Painting Council.

C. Specification for Design of Cold-Formed Steel Structural Members by American Iron and Steel Institute.

D. ANSI A14.3 Safety Code for Fixed Ladders.

1.3 RAILINGS DESIGN

A. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:
   1. Top Rail of Guards: Capable of withstanding following loads applied as indicated:
      a. Concentrated load of 200 lbf applied at any point and in any direction.
   2. Handrails Not Serving as Top Rails: Capable of withstanding following loads applied as indicated:
      a. Concentrated load of 200 lbf applied at any point and in any direction.

1.4 SUBMITTALS

A. Comply with Section 013300.

B. Shop Drawings: Indicate dimensions, description of materials and finishes; include plans, elevations, sections, and details of metal stairs and their connections and reactions to building structure. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections, and installation procedures, including specific requirements indicated.
   1. Indicate design criteria and reactions to structure.
   2. Construction details, sizes of metal sections, thickness of metals, profiles, attachments, dimensions and field joints, method of support from structure, and finishes.
   3. Work to be built-in or provided by other Sections.
   4. Welding: Indicate welded connections, both shop and field, using standard AWS welding symbols. Indicate net weld lengths.

5. Provide shop drawings signed and sealed by qualified professional engineer responsible for their preparation licensed in State where project is located.
6. Provide engineering calculations if requested.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.5 QUALITY ASSURANCE

A. Applicable Standards: AISC "Specifications for Design of Cold-Formed Steel Structural Members" and AWS "Structural Welding Code".

B. Qualification for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

C. Field Measurements: Take field measurements prior to fabrication to insure proper fitting of work.

D. Shop Assembly: Preassemble metal items in shop to greatest extent possible, so as to minimize field splicing and assembly. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

E. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project and with record of successful in-service performance, as well as sufficient production capacity to produce required units.

F. Professional Engineer Qualifications: Professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of handrails and railing systems that are similar to those indicated for this Project in material, design, and extent of work.

1.6 HANDLING AND STORAGE

A. Load, unload, handle and store work in manner that will not bend, deform or otherwise damage metal. Store so metal and shop coats will not be subject to weather or moisture, store off ground and provide covering for metal in storage.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 PRODUCTS

2.1 MATERIALS

A. Metal Surfaces: For fabrication of miscellaneous metal work items which will be exposed to view, use only materials which are smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names and roughness. Select steel for exposed work to provide best possible appearance.

B. Steel Plates, Shapes and Bars: ASTM A36.

C. Steel Tubing: ASTM A501 or ASTM A500.

D. Steel Pipe: ASTM A53, Type S, Grade A, standard weight and extra-strong as required, galvanized and plain.

E. Galvanized Sheet Metal: ASTM A526 or A527, G-90 coating designation with both sides of metal prime painted.

F. Galvanizing: ASTM A123, hot dip galvanizing, thickness Grade 55 unless otherwise indicated.
1. Galvanize exterior steel fabrications, steel at exterior wall locations, and where steel is exposed to weather.

G. Fasteners: As indicated and recommended by manufacturer. Provide zinc- coated fasteners for exterior use or where built into exterior walls.
   1. Provide stainless steel fasteners where indicated and where dissimilar metals are connected. Where dissimilar metals are connected, provide neoprene spacer or washer for isolation.

H. Stainless Steel: ASTM A167, Type 304 with #4 finish. Passivate exterior stainless steel.

I. Metal Primer Paint: Provide comparable primer recommended by finish coat manufacturer which is lead and chromate free, Low VOC complying with VOC guidelines.
   1. Primer to Receive Fire Protection Treatment: See applicable Division 7 Section for primer to be applied by this Section.
   2. Primers for Painting: See Section 099000 for primers to be applied by this Section.

2.2 FABRICATION

A. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to radius of 1/32 inch, unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

B. Weld corners and seams continuously and in accordance with AWS. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

C. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners wherever possible.

D. Fabricate and space anchoring devices to provide adequate support. Cut, reinforce, drill and tap metal work to receive finish hardware and similar items.

E. Shop Painting: Remove scale, rust and other deleterious materials before shop coat of paint is applied. Apply shop coat of metal primer to fabricated metal items in accordance with manufacturer's printed instructions, with full coverage of joints, corners and edges.

2.3 HANDRAILS AND RAILINGS

A. Cope intersections of rails and posts, weld joints and grind smooth. Butt weld end-to-end joints of railing or use welding connectors.
   1. Galvanize handrails and railings.

B. Weld corners and seams continuously and in accordance with recommendations of AWS. Grind exposed welds smooth and flush, to match and blend with adjoining surface. Discoloration of finished surfaces is not acceptable.

C. Form exposed connections with flush, smooth, hairline joints, using concealed fasteners. Provide for anchorage to supporting structure. Fabricate and space anchoring devices as indicated and required for adequate support.

D. Provide brackets, flanges, and anchors for railing posts and for handrail supports. Provide inserts and sleeves for anchorage to concrete or masonry work.

E. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of pipe.

F. Provide wall returns at ends of wall-mounted handrails, except where otherwise indicated.

G. Close exposed ends of pipe by welding 3/16 inch thick steel plate in place or by use of prefabricated fittings.

H. Handrail Brackets for Wall Mounting: Malleable iron, 2-1/2 inch or 2-3/4 inch diameter wall plate: Center on rail 2-1/2 inches from wall.
   1. Acceptable manufacturer:
      a. Julius Blum Company, Inc: No 382.
      b. J.G.Braun Company: No. 4596.
      c. R&B Wagner, Inc.: No. 1770.

2.4 RAILING FABRICATION

A. Fabrication of Handrails and Guardrails:
   1. Handrails (RAIL-1): Handrails shall have an outside diameter of 1-1/2".
   2. Inside handrails shall be continuous and shall sweep around smoothly at landings.
   3. Outside handrails shall be mounted on wall brackets as required to meet performance requirements and shall have extensions at top and bottom of stair runs as indicated on the Drawings and required by accessibility standards.
   4. Intermediate Guard Configuration: Intermediate guard shall be configured as indicated on drawings.
      a. Provide railing system consisting of 1-1/2 inch round sloping strands following each stair run and 1-1/2 inch round top rails that continuously sweep around at each corner.
   5. At stair system and at each floor landing (except lower level) provide 3'-6" high guard rails.

2.5 SHIPS LADDERS

A. (MET FAB-1) Ships Ladders: Fabricate steel ships ladders of open-type construction with channel or plate stringers, pipe and tube railings, and bar grating treads, unless otherwise indicated. Provide brackets and fittings for installation.
   1. Comply with ANSI A14.3, unless otherwise indicated.
   2. Angle of Inclination: 60 degree angle from floor.
   3. Treads 24 inches long and approximately 6 inches wide.
   4. Handrails: 1-1/2 inch diameter pipe or tube.
   5. Interior Ships Ladders: Prime ships ladder, including treads, railings, brackets, and fasteners, with zinc-rich primer.
   6. Exterior Ships Ladders: Galvanize ships ladder, including treads, railings, brackets, and fasteners.

2.6 METAL LADDERS

A. (MET FAB-2) Interior Steel Ladder:
   1. Comply with ANSI A14.3, unless otherwise indicated.
   2. Height as indicated on Drawings.
   3. Siderails: Continuous, 3/8 by 2-1/2 inch steel flat bars, with eased edges. Space siderails 16 inches apart, unless otherwise indicated.
   4. Rungs: 3/4 inch diameter steel bars at 12 inches on center.
   5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   6. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
   7. Support each ladder at top and bottom, and not more than 60 inches o.c. with welded or bolted steel brackets.
   8. Prime with zinc-rich primer.

B. (MET FAB-3) Exterior Steel Roof Ladder:
   1. Comply with ANSI A14.3, unless otherwise indicated.
   2. Height and profile as indicated on the Drawings.
   3. Siderails: Continuous, 3/8 by 2-1/2-inch steel flat bars, with eased edges, and curved over the top to provide support. Space siderails 16 inches apart, unless otherwise indicated.
   4. Rungs: 3/4 inch diameter steel bars at 12 inches (305 mm) on center.
   5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   6. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
   7. Support each ladder at top and bottom, and not more than 60 inches o.c. with welded or bolted steel brackets.
   8. Galvanize exterior roof ladders, including brackets and fasteners.

2.7 METAL FABRICATIONS

A. (MET FAB-4): Steel tube frame with woven wire infill guardrail.

1. 1 x 1 x 0.125 square tube welled frame, guard rail infill shall be 8 gauge woven wire mesh, 2 inch by 2 inch square pattern with 14 gauge bent steel U-molding on 4 sides, welded to tube frame. All welds ground smooth. Assembly hot dip galvanized finish. Configurations as indicated on the drawings.

2.8 BOLLARDS

A. (MET FAB-8) Bollards Imbedded in Concrete: Hot-dipped galvanized steel pipe, 6 inch dia., 7 feet long, concrete filled, crowned cap, prime paint finish only the exposed top 3'-6".
   1. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
   2. Fill bollards solidly with concrete, mounding top surface to shed water.

B. (MET FAB-10) Removable Bollards: Cal Pipe Security Bollards as indicated on Drawings and consisting of the following components:
   1. 3.5” dia. Internal Locking Removable Pipe Bollard Model #1BR-3000.
      a. Exposed pipe above footing: 36” high.
      b. Sleeve for pipe in concrete footing: 12” deep.
   2. Standard Concrete Footing, 21”x 21”x 21”; with rebar cage: #4 bar, 16”x 16”x 16”.
   3. Tamper proof screw provided for securing cover when bollard removed.

2.9 METAL GRATINGS

A. (GRT-1) Galvanized Metal Gratings: Borden Metal Products Type B size 5 pressure locked steel gratings with 1-1/4 inch by 1/8 inch bearing bars at 1-3/16 inch centers and 3/4 inch by 1/8 inch cross bars at 4 inch centers, galvanized finish in accordance with ASTM A123.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which miscellaneous metal items are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Provide setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Provide anchorage devices and fasteners where necessary for securing miscellaneous metal items to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

C. Perform cutting, drilling and fitting required for installation of miscellaneous metal items. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

D. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch up shop paint coat. Do not weld, cut or abrade surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

E. Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

F. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 2 mils.

G. Erect stair work to line plumb, square, and true with runs registering level with floor and platform levels.

H. Install alternating tread stair and accessories according to reviewed shop drawings and manufacturer instructions.

I. Install channel support framing system and accessories in accordance with reviewed shop drawings and manufacturer's printed instructions.

J. Install metal gratings and supports according to reviewed shop drawings and manufacturer instructions.

3.3 HANDRAILS AND RAILINGS

A. Provide anchorage devices and fasteners for securing handrails and railings to in-place construction.

B. Adjust railing prior to securing in-place to ensure proper matching at butting joints and correct alignment. Secure posts and rail ends to building construction.

C. Anchor steel pipe rails in concrete by means of galvanized pipe sleeves set and anchored into concrete. Provide steel plate closure secured to bottom of sleeve and of width and length not less than one inch greater than sleeve. After post is inserted into sleeve, fill sleeve solid with quick-setting hydraulic cement.

D. Anchor rail ends to supporting structure with flanges welded to rail ends and bolted to supporting members in accordance with reviewed shop drawings. Secure handrails to walls with wall brackets and end fittings

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Miscellaneous wood framing.
   2. Concealed wood blocking and nailers.
   3. Wood furring and grounds.
   4. Roof and parapet sheathing.
   5. Concealed sheathing.
   6. Subflooring,
   7. Underlayment.
   8. Pegboards.
   9. Air barrier, and vapor retarder in connection with wood framing.
   10. Preservative treatment.
   11. Fire-retardant treatment.
   12. Anchors nails, bolts, and screws.

B. Related Sections:
   1. Section 061500 - Wood Decking.
   2. Section 061600 –Sheathing.
   3. Section 061753 – Shop Fabricated Wood Trusses.
   4. Section 062023 – Interior Finish Carpentry.
   5. Section 064000 - Architectural Woodwork.
   6. Section 075300 – Single Ply Membrane Roofing.
   7. Section 079000 – Joint Protection.
   8. Section 085200 – Wood Windows.
   9. Section 099600 – High Performance Coatings: Fire-Resistant Coatings.

1.2 DEFINITIONS

A. The following definitions apply to this section as they pertain to rough carpentry items.
   1. Rough Carpentry: Carpentry work not specified in other Sections and not used as exposed work.

1.3 DESCRIPTION

A. Concealed wood framing, blocking, sheathing, subflooring, underlayment, anchors, fasteners, adhesives, and related items, including accessories furnished and installed as specified herein.

1.4 SUBMITTALS

A. Product Data: Submit for carpentry in accordance with Section 013300, Submittals.
   1. Submit for sheathing, air infiltration barrier, vapor retarders, tapes, sealants, and miscellaneous products specified.

B. Certification:
   1. Submit letter certifying that lumber is kiln-dried to 15 - 19 percent moisture content, well seasoned, grade marked, trade marked and free from warp.
   2. Submit letter from treatment plant certifying that chemicals and process used and net amount of salts retained are in conformance with specified standards
   3. Submit letter certifying that fire-retardant treatment materials comply with requirements herein stated and local authorities having jurisdiction and that treatment will not bleed through finished surfaces.

1.5 QUALITY ASSURANCE

A. Lumber Standard:
   1. Comply with U.S. Dept. of Commerce Product Standard PS 20, including moisture content and actual sizes related to indicated nominal sizes.
   2. Comply with Standard Grading Rules No. 16 for West Coast Lumber.
   3. Comply with American Softwood Lumber Standard and with application grading rules of inspection agencies certified by American Lumber Standard Committee's (ALSC) Board of Review.
   4. Comply with lumber producer's inspection agency grading rules certified as conforming to "National Grading Rules for Dimension Lumber" established under Section 10 of PS 20 and local code standard.

B. Plywood Standard: Comply with U. S. Product Standard PS 1-74/ANSI A199.1; and Grades and Specifications, Performance-Rated Panels and Specifications by APA – The Engineered Wood Association local code standard. Each construction and industrial panel shall bear APA trademark and appropriate identification.

C. Mat-Formed Particleboard: Comply with ANSI A208.1. Provide particleboard bearing NPA grade marking.

D. Lumber: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying agency, grade, species, moisture content at time of surfacing and mill.
   1. Seasoning: Kiln-dry lumber to 15 - 19 percent moisture content, well-seasoned, grade marked, trade marked and free from warp.

E. Provide Forest Stewardship Council (FSC).
   1. [insert product here]

1.6 DELIVERY, STORAGE AND HANDLING

A. Inspect wood materials for conformance to specified grades, species, and treatment at time of delivery to Project site.
   1. Reject and return unsatisfactory wood materials.

B. Provide facilities for handling and storage of materials to prevent damage to edges, ends and surfaces.

C. Keep carpentry materials dry.
   1. Store lumber and plywood in stacks with provision for air circulation within stacks.
   2. Protect bottom of stacks against contact with damp surfaces. Protect exposed materials against weather.
   3. Stack materials minimum 12 inches off ground, or if on concrete slab-on-grade, minimum 1-1/2 inches, fully protected from weather.
   4. Provide for air circulation within and around stacks and under temporary coverings.

D. Place spacers between each bundle of pressure treated materials treated with waterborne chemicals to provide air circulation.

1.7 PROJECT CONDITIONS

A. Environmental Impact: Products containing following materials will not be permitted:
   1. Urea Formaldehyde.
   2. Chromium in wood pressure treatment products.
   3. Arsenic.

1.8 COORDINATION

A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit, show location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.
   1. Coordinate work directly with other subcontractors as necessary to insure proper fitting, joining or to clearances of other work. Obtain templates as required to insure proper fitting.

PART 2 PRODUCTS

2.1 LUMBER

A. Dimension Lumber: Finished 4 sides, 15 percent maximum moisture content. Mark lumber "S-DRY".
   1. Light Framing: Construction grade Douglas Fir or Southern Pine, appearance grades where exposed.
   2. Boards: Construction grade.

B. (WD BLKG-1) Miscellaneous Lumber: Lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members.
   1. Moisture content of 19 percent maximum for lumber items not specified to have wood preservative treatment.
   2. Grade: No. 3 or standard grade.

2.2 WOOD SHEATHING

A. (WD SHTG-1) Concealed Sheathing: APA, C-D touch-sanded plugged. Exposure 1, 3/4 inch, square edge, Douglas Fir.

B. (WD SHTG-2) Concealed Sheathing: APA C-D EXT touch-sanded plugged. Exposure Exterior, 3/4 inch, square edge, moisture treated, Douglas Fir.

C. (WD SHTG-3) Concealed Sheathing: APA EXT, Rated Structural 1, touch sanded, Exposure 1, 23/32 or 3/4 inch depending on availability, square edge, moisture treated, Douglas Fir.

D. (WD SHTG-4) Concealed Sheathing: OSB, Structural 1, Exposure 1 sheathing, 5/16 inch thickness for 16 inch stud spans, 3/8 inch thickness for 24 inch stud space.

E. (WD SHTG-5) Roof Sheathing: Particleboard, grade 2-M-W, 5/8 inch thickness for 16 inch spans, 3/4 inch thickness for 24 inch space.

F. (WD SHTG-6) Roof Sheathing: APA EXT, C-D Exposure Exterior, 3/4 inch, square edge, Douglas Fir.

G. (WD SHTG-7) Floor Sheathing: APA INT, C-D with intermediate glue, unsanded, tongue and groove edge, thickness shown, Douglas Fir.

H. (WD SHTG-8) Exposed Sheathing: APA Douglas Fir, with medium density overlay (MDO) for painted finish, 3/4 inch, square edge.

I. (WD SHTG-9) Exposed Sheathing for Paint: APA, one or both sides exposed in finish work. Exposure 1, Veneer Grade B, APA A-B Group 1, exposure 2, 3/4 inch, square edge fire-resistive treated, Douglas Fir.

J. (WD SHTG-10) Back: APA INT C-D Grade Interior unsanded backing for wood panels, 3/8 inch (1cm) thick.

2.3 SUBFLOOR AND UNDERLAYMENT

A. (WD SHTG-13) Subflooring: Particleboard, grade 2-M-W; 5/8 inch thickness for 16 inch span; ¾ inch thickness for maximum 19.2 inch span.

B. (WD SHTG-14) Underlayment: APA, INT, underlayment with exterior glue.

C. (WD SHTG-15) Underlayment: APA EXT, A-C sanded (under seamless and sheet vinyl flooring).

D. (WD SHTG-16) Underlayment: Particleboard grade 1-M-1; 1/2 inch thickness minimum. Provide grade 2-M-1 throughout damp or humid areas.

E. (WD SHTG-17) Underlayment: APA C-D plugged. Exposure 1, 1/2 inch square edge, fire-resistive treated Douglas Fir.

F. (WD SHTG-18) Underlayment: APA, A-C EXT, Exposure Exterior, ½ inch, square edge, moisture treated, Douglas Fir.

G. (WD SHTG-20) Stair Treads: Particleboard treads grade 1-M-1; 3/4 inch minimum thickness, maximum 30 inch span.

2.4 INSULATION BOARD SHEATHING

A. (IBS SHTG-1) Extruded Polystyrene Foam Wall Sheathing: ASTM C578, Type IB, standard lengths and widths with tongue and groove or shiplap long edges as required for intended use.

B. (IBS SHTG-2) Polyisocyanurate Foam Wall Sheathing: Aluminum-foil faced, glass-fiber reinforced, rigid, cellular, polyisocyanurate thermal insulation complying with ASTM C1289, Type I, Class 2.
   1. Foam plastic core and facings with flame-spread index of 25 or less when tested individually.

2.5 AIR INFILTRATION BARRIER

A. (AF-1) Asphalt Building Paper: Asphalt saturated felt, Type I, ASTM D226; No. 15 unperforated asphalt felt.

2.6 PRESERVATIVE TREATMENT

A. Ammoniacal, or amine, copper quat ACQ: AWPA C22-92.

B. (PPT-1) Extent of Treatment:
   1. Wood nailers and blocking in contact with cementitious materials.
   2. Plywood at parapets

C. Coat cut surfaces after treatment with brush coat of same preservative treatment. Allow preservative to dry prior to placing members.

2.7 FIRE-RETARDANT TREATMENT

A. (FRT-1) Fire Retardant Treatment: Pressure impregnation with fire-retardant chemicals.

B. Manufacturers:
   1. Dricon by Arch Wood Products,
   2. Pyro-Guard by Hoover Treated Wood Products,

C. Lumber and Plywood Treatment:
   1. Each piece to bear:
      a. UL FR-S rating (flame spread and smoke developed less than 25),
      b. Complying with extended 30-minute tunnel test, ASTM E84 or UL 723
      c. Meet interior Type A requirements in AWPA Standard C-20 for lumber and C-27 for plywood.
      d. And shall be registered for use as a wood preservative by the U.S. Environmental Protection Agency.
   2. Treatment to provide protection against:
      a. Termites,
      b. Fungal decay
   3. Treatment to be free of:
      a. Hologens
      b. Sulfates,
      c. Ammonium phosphate,
      d. Formaldehyde.

D. After treatment: Material shall be dried to an average moisture content of 15 percent or less for plywood and 19 percent or less for other lumber.

E. Complete fabrication prior to treatment to minimize cutting and jointing after treatment.
   1. Coat surfaces cut after treatment with heavy brush coat of same fire-retardant chemical.

F. Do not use twisted, warped, bowed or otherwise damaged or defective pieces.

G. Extent of Treatment: Wood materials as part of fire-rated assemblies shall be fire retardant treated, and as indicated, with (FRT-1).

2.8 ROUGH HARDWARE, FASTENERS AND ANCHORAGE DEVICES

A. Extent: Provide rough hardware required, including nails, screws, bolts, lag screws, cinch anchors, toggle bolts, shot anchors and similar items.
   1. (Joist Hangers: Sized and profiled to suit applications, galvanized.)

B. General: Provide proper size and type for use intended and for materials to be fastened.
   1. Install adequate hardware to insure substantial and positive anchorage.
   2. Use galvanized for exterior locations and high humidity locations and treated wood, plain finish for other interior locations.
   3. Fasteners, hangers and bearing plates used on or in connection with treated wood shall comply with IBC 2304.9.

C. Nails: Conform to materials standards established under FS FF-N-105.
   1. At exterior work, use galvanized steel nails.
   2. Refer to IBC Nailing Schedule for quality and size.

D. Fasteners for Wood Wall Bumpers:
   1. Concrete and Masonry walls: 5/8 inch diameter by 5-1/2 inch (minimum) hooked bolts with heavy flat washers, lock washer and hex head nut - flush fill concrete masonry block cavities with concrete to 24 inch (minimum) for single bumper and 48 inch (minimum) for double bumpers.
   2. Metal Stud Wall: 1/2 inch diameter (minimum) toggle bolts plus a continuous 14 gauge metal plate backing welded to metal studs.

E. Mechanical Fasteners for Wood Decking: Swaneze stainless steel decking screws.

2.9 ROOF VENTS

A. (RV-1): Ridge Vents: Continuos roof vent at peak of roof.
   1. Product: SurVent Ridge Vents by Owens Corning

B. (RV-3) Soffit Vents: Aluminum soffit vents and strips with screens and baffles vents as indicated.
   1. Width: As indicated
   2. Open Area: 50 percent
   3. Products:
      a. Perimeter Systems, Div of Southern Aluminum Finishing Company: Type 4
      b. Fry Reglet Company Aluminum Soffit Vents.

C. (RV-4) Vents: Vinyl soffit vents and strips with screens and baffles vents as indicated.
   1. Width: As indicated
   2. Acceptable Manufacturers:
      a. Vinyl Soffit Vent by AMICO (Alabama Metal Industries).
   3. Painted finish in color selected by Architect.

2.10 TAPES, SEALANTS AND MISCELLANEOUS

A. Adhesive: As recommended by manufacturer of product to be applied for surface material to give permanent adhesion, with material remaining flat to back surface. Comply with local code standards.
   1. Comply with APA AFG-01 for adhesive for use with type of construction panel indicated.
   2. Exterior: Phenolic resin waterproof glue.
   3. Interior: Water-resistant casein and other adhesives suited for particular use.

B. Expansion Material: Dow Chemical Ethafoam. Use where expansion joint material is indicated and not installed under other sections.

C. Concealed Sealants: Polyisobutylene sealant
   1. Tremco's Curtainwall Sealer.

D. Soft Gasket or Urethane Insulation:
   1. Product: Ester 72PP from American Convertors; flexible semi- closed cell urethane.

a. Distributor: Brock-White Company, Minneapolis, Minnesota.
2. Provide 1/2 inch thicker than joint where foam tape, foam gasket and urethane insulation is indicated and not provided under other sections.
3. Location: At gaps between framing and other materials.

E. Expanded Closed-Cell Filler (ECCF-1):
1. Product: Everlastic NN-1, 1040 Series from Williams Products, Inc.; flexible closed-cell sponge rubber, with blend of neoprene, EPDM, and SBR.
a. Compression/Defection at 25 percent deflection: 2 to 5 pounds per square inch.
b. Elongation: 150 percent.
c. Ultimate tensile strength: 75 pounds per square inch.
d. Distributor: Brock-White Company, Minneapolis, Minnesota.
2. Field cut to thickness, width, and length where foam tape, foam gasket and urethane insulation is indicated and not provided under other sections.
3. Location:
a. Expansion joint filler in masonry and concrete.
b. Filler support sealant in traffic bearing joints.
c. Gaps between open web joists or beams and gypsum board surfaces.

F. Sill Sealer Gaskets:
1. Glass-fiber resilient insulation, fabricated in strip form for use as a sill sealer.
2. Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 EXECUTION

3.1 FRAMING, NAILERS, BUCKS, CANT STRIPS

A. Install plumb, level, true and square to dimensions shown and required. Allow for finishes and proper clearances where necessary.

B. Provide sound bearing, square cuts, and full bearing surfaces. Set crown up for horizontal members. Shim and block where required.

C. Eliminate crooked, twisted, cupped or bowed framing where required.

D. Anchorage: Adequately anchor, fasten and support members to form secure, substantial and accurate anchorage and to hold required dimensions and prevent twist.
1. Use bolts and screws to eliminate loosening up of joints, sagging or similar movement.
2. Use nailers for securing gravel stops, cornices, and where otherwise shown or required.

3.2 FURRING, STRIPPING, GROUNDS AND BACKING

A. Install plumb, level, true and square. Anchor substantially for permanent installation. Set and shim to straight edge so finish wall is true and straight.

B. Provide grounds and backing as shown or required. Blocking as required or shown on drawings for plumbing fixtures, brackets, drapery rods, window and door frames, built-in furniture and other woodwork, both interior and exterior.

C. Allow for finishes and shim out to form level surfaces. Verify ground sizes and locations before installation.

3.3 INSTALLATION OF SHEATHING

A. Install plywood in accordance with Plywood Construction Guide by APA – The Engineered Wood Association.

B. Place roof and wall sheathing with end joints staggered. Secure sheets over firm bearing.
1. Maintain minimum 1/16 inch and maximum 1/8 inch spacing between joints on walls. Place perpendicular to framing members.

C. Comply with roofing manufacturer's requirements for sheathing attachments.

3.4 SUBFLOORING

A. Place subflooring with end joints staggered. Secure sheets over firm bearing. Maintain surface flatness of maximum 1/8 inch in 10 feet or more.

3.5 AIR INFILTRATION BARRIER (BUILDING PAPER)

A. Cover sheathing with air infiltration barrier (building paper).
   1. Apply air infiltration barrier to comply with manufacturer's written instructions. Apply to cover upstanding flashing with 4-inch overlap.
   2. Apply asphalt-saturated organic felt horizontally with 2-inch overlap and 6 inch end lap; fasten to sheathing with galvanized staples or roofing nails.

3.6 PARTICLEBOARD

A. Where acceptable to governing authorities, particleboard may be used for subfloor, wall and roof sheathing, and stair treads in lieu of plywood.

B. Install particleboard in accordance with appropriate National Particleboard Association installation recommendations.

C. Seal edges of particleboard at damp and humid areas.

3.7 VAPOR RETARDER

A. Attach vapor retarder to wood framing with nails or staples. Adhesive apply to other surfaces.

B. Seal joints in vapor retarder by lapping and bonding with adhesive.

C. Seal nails or staples with vapor retarder tape.

3.8 FACTORY WOOD TREATMENT

A. Shop pressure treat and deliver to site ready for installation, wood materials requiring UL fire rating or pressure impregnated preservatives.

B. Provide UL approved identification on fire resistant treated materials.
   1. Deliver fire retardant treated materials cut to required sizes so as to eliminate necessity of field cutting.

C. Ensure exposed materials requiring stain or paint finish do not exceed 15 percent moisture content before applying wood preservative treatment.

3.9 SITE TREATMENT OF WOOD MATERIALS

A. Apply preservative treatment in accordance with manufacturer's printed instructions.

B. Brush apply 2 coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

D. Ensure exposed materials requiring stain or paint finish do not exceed 15 percent moisture content before applying wood preservative treatment.

END OF SECTION

SECTION 062013
EXTERIOR FINISH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior somposite standing and running trim
   2. Shop finishing exterior woodwork.

B. Related Sections:
   1. Section 061000 - Rough Carpentry: Wood framing, studs, blocking, grounds, nailers, furring and stripping, plywood, and fire-resistive and preservative treatment.
   2. Section 074646 – Mineral Fiber Cement Siding
   3. Section 099000 - Painting: Painting and finishing of finish carpentry items.

1.2 DEFINITIONS

A. The following definitions apply to this section as they pertain to finish carpentry items.
   1. Finish Carpentry: Exposed exterior finish carpentry work not specified in other sections.

1.3 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 013300.
   1. Submit shop drawings of siding and trim and moldings.
   2. Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware and installation procedures, including specific requirements indicated.

B. Product Data: Submit for each type of factory-fabricated product and process specified.
   1. Include details of construction relative to materials, dimensions of individual components, profiles, textures and colors.

C. Certifications: Submit statements of qualification and compliance as specified.

D. Samples: Submit samples of exterior finish carpentry items.
   1. Lumber for exterior wood stain finish, 50 sq. in., for each species, with 1/2 of exposed surface finished with coating specified in Division 9 Section "Painting."

1.4 QUALITY ASSURANCE

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

B. Quality Standard: Unless otherwise indicated, comply with WIC's "Manual of Millwork" for grades of exterior architectural woodwork, construction, finishes, and other requirements.
   1. Provide WIC-certified compliance certificate indicating that woodwork complies with requirements of grades specified.
   2. Provide WIC-certified compliance certificate for installation.

C. Certifications:
   1. Provide a statement of qualification for fabricator and installers.
   2. Provide a statement of compliance indicating fabrication is in accordance with AWI Custom Grade Standards.

D. Lumber Standard: Comply with PS 20, including moisture content and actual sizes related to indicated nominal sizes.
   1. Comply with Standard Grading Rules No. 16 for West Coast Lumber Standards. Comply with Western Wood Products Association (WWPA), and Southern Pine Inspection Bureau (SPIB).

1.5 PRODUCT HANDLING

A. Keep carpentry materials dry during delivery, storage and handling.

B. Protect finish carpentry items from damage, dust and dirt.

C. Do not deliver finish carpentry items until site conditions are adequate to receive work of this section.

1.6 PROJECT CONDITIONS

A. Do not deliver or install exterior finish carpentry until weather, temperature and relative humidity are at acceptable levels.

1. Store finish carpentry items in ventilated areas with constant but minimum temperature of 60 degree F., and relative humidity of 25 to 55 percent.

B. Install exterior finish carpentry only when existing and forecasted weather conditions will permit work to be performed according to manufacturer=s recommendations and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

1.7 COORDINATION

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

1. Obtain templates as required to insure proper fitting. Verify electrical and mechanical characteristics with other subcontractors if required and exchange shop drawings.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the WIC quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

1. Hardboard: AHA A135.4.
2. Softwood Plywood: DOC PS 1, Exterior.
3. Medium-Density Fiberboard: ANSI A208.2, Grade MD-Exterior Glue.

2.2 EXTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

A. (CTRIM-1): Trim Boards: 4/4 MIRATEC trim boards, primed engineered treated exterior composite trim.

1. Material: Wood fibers combined with phenolic resins, zinc borate, water repellant, with no added urea formaldehyde resins.
2. Moisture Resistance: ASTM D1037.
3. Rot resistant: AWPA E16.
4. Termite Resistant: AWPA E7.
5. 30 year warranty.
6. Manufacturer: CMI, 500 west Monroe street, Suite 2010, Chicago, IL 60661 866-382-8701, www.miratectrim.com

2.3 FASTENERS AND ANCHORAGE DEVICES

A. Fasteners for Exterior Finish Carpentry: Provide nails of materials specified, in sufficient length to penetrate minimum of 1-1/2 inches into substrate, unless otherwise recommended by manufacturer.

1. Stainless steel fasteners or prefinished aluminum mails in color to match paint, where face nailing of material to receive paint is unavoidable.

B. Nails: Conform to materials standards established under FS FF-N-105. At exterior work, use annular thread, split less type, type 304 stainless steel, of sufficient length to penetrate sheathing.

1. Refer to standard nailing schedules for quality and size.

2.4 SEALANTS AND MISCELLANEOUS

A. Adhesive: As recommended by manufacturer of product to be applied for surface material to give permanent adhesion, with material remaining flat to back surface.
   1. Glue: Aliphatic-or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

B. Expansion Material: Dow Chemical Ethafoam. Use where expansion joint material is indicated and not installed under other sections. Use for sill sealer as required.

C. Flashing: Comply with requirements of Section 076210, Flashing and Sheet Metal for flashing materials installed in finish carpentry.
   1. Aluminum Flashing: Refer to Section 076210.

D. Sealants: Comply with requirements of 079000 - Sealants for materials required for sealing exterior work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

C. Prime and backprime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Section 099000 - Painting.

3.3 INSTALLATION

A. Install in neat and workmanlike manner, free from hammer or tool marks, open joints or slivers.

B. Install siding and trim in accordance with requirements to produce pattern indicated on drawings with weather exposure indicated over wall area.

C. Set plumb, level, square and true to dimensions shown and required. allow for finishes and proper clearances where necessary. Use concealed shims where required for alignment.

D. Do not use finish carpentry materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

E. Anchorage: Adequately anchor, fasten and support members to form secure, substantial and accurate work and to hold required dimensions and prevent twist. Miter corners, countersink nails, drill holes for nails in hardwood. Fill surface flush, and sand where face nailing is unavoidable.

F. Anchor substantially for permanent installation. Set and shim to straight edge so finish wall is true and straight. Provide grounds and backing as shown or required. Allow for finishes and shim out to form level surfaces. Verify ground sizes and locations before installation.

G. Install boards with butt joints, and use finishing nails for exposed work.

H. Finish Carpentry: Install exterior work according to specified requirements.
   1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Install to tolerance of 1/8 inch in 96 inches for plumb and level. Install adjoining finish carpentry with 1/32 inch maximum offset for flush installation and 1/16 inch maximum offset for reveal installation.

3. Coordinate with materials and systems in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.
4. Refer to Section 099000 - Painting for final finishing of finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary.
   1. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint.
   2. Use scarf joints for end to end joints. Plane backs of casings to provide uniform thickness across joints if required.
      a. Match color and grain pattern across joints.
      b. Fit exterior joints to exclude water.
      c. Fasten to prevent movement or warping.
      d. Countersink fastener heads on exposed carpentry work.

3.5 ADJUSTING

A. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry.
   1. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

A. Provide final protection and maintain conditions that ensure finish carpentry is without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concealed building insulation.
   2. Loose-fill building insulation.

B. Related Sections:
   1. Section 054000 - Cold-Formed Metal Framing: Steel stud wall framing.
   2. Section 072670 - Moisture Barriers.
   3. Section 075305 - Membrane Roofing: Roof insulation.
   4. Section 078443 - Fire Resistant Joint Sealants
   5. Section 092900 - Gypsum Board: Acoustical insulation.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
   1. Surface-Burning Characteristics: ASTM E84.
   2. Fire-Resistance Ratings: ASTM E119.
   3. Combustion Characteristics: ASTM E136.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:
   1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
   3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.1 MATERIALS

A. (INSUL-20) Batt or Blanket Insulation: ASTM C665; Type I (blankets without membrane facing); consisting of fibers manufactured from glass; conforming to the following:
   1. Nominal density of 1.0 lb/cu. ft., thermal resistivity of 3.7 deg F x h x sq. ft./Btu x in. at 75 deg F
   2. Fire Characteristics:
      a. ASTM E 84:
         1) Maximum flame-spread of 25
         2) Maximum smoke-developed indices of 50

b. ASTM E 136: Passes.
3. Thickness: Same as stud depth or as indicated.
4. Width of Batts: Center to center dimension of metal studs and full face to face at other voids.
5. ASTM C665; Type I Class A.

B. (INSUL-21) Fiberglass Batt or Blanket Insulation with Foil Facing: ASTM C665; Type III Class B and C, foil-faced fiberglass batt insulation with integral vapor barrier; conforming to the following.
1. Fire Characteristics:
a. ASTM E84:
1) Maximum flame-spread of 25
2) Smoke-developed indices of 50
2. Thickness: Same as stud depth or as indicated.
3. Width of Batts: Center to center dimension of metal studs and full face to face at other voids.

C. (INSUL-22) Flame Resistant, Foil-Faced, Flexible Glass-Fiber Board Insulation: ASTM C612, Type III or ASTM C 553, Types II, Class A; faced on one side with polypropylene foil-scrim-kraft facing; designed for exposed applications and of the following properties:
1. Nominal density of not less than 1.5 lb/cu. ft. nor more than 1.7 lb/cu. ft., thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F.
2. Fire Characteristics:
a. ASTM E84:
1) Maximum flame-spread of 25
2) Maximum smoke-developed indices of 50
b. ASTM E 136: Passes.
3. Thickness: Same as stud depth or as indicated.
4. Width of Batts: Center to center dimension of metal studs and full face to face at other voids.
5. Acceptable Manufacturer:
a. Johns Manville: FSK-25
b. Owens Corning: Flame Spread 25 FRK

2.2 SPRAY POLYURETHANE FOAM INSULATION

A. (INSUL-31) Closed-Cell Slow Rise Foam Insulation: Versi-Foam Systems 15 and 50.
1. In Place density of 2.0 lb/cu. Ft
2. Fire Characteristics per ASTM E84:
a. Flamespread: N/A
b. Smoke-developed indices: N/A
3. Coordinate field application as recommended by Manufacturer when determining conditions in selecting either the Systems 15 or 50.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

F. Refer to Section 072600 - Vapor Retarders, for installation of vapor retarder. Coordinate with Section 072600 for installation of insulation to insure protection of insulation and retarder.

3.2 INSTALLATION QUALITY

A. Install rigid insulation to maintain continuous and complete thermal protection for building spaces and elements.

B. Ensure surfaces which are to receive rigid insulation are clean, free of deleterious matter and are sufficiently level to allow proper installation of insulation.

C. Cut and trim insulation neatly to fit spaces. Butt edges and ends tight. Fit insulation tight against mechanical, electrical and other items which protrude through plane of insulation.

D. Use insulation free of broken or chipped edges.

3.3 PREPARATION

A. Clean substrates and substances harmful to insulation or vapor retarders, including removing projections capable of puncturing retarders or interfering with insulation attachment.

3.4 BATT INSULATION INSTALLATION

A. Install batt and blanket insulation (INSUL-20) and (INSUL-24) in accordance with manufacturer's instructions.

B. Trim insulation neatly to fit spaces which are less than stud spacing.

C. Fit insulation tight within spaces and tight to and behind mechanical and electrical services within plane of insulation. Leave no gaps or voids.

3.5 BATT INSULATION INSTALLATION

A. Install batt and blanket insulation (INSUL-21) in accordance with manufacturer's instructions.

B. Fit insulation tight within spaces and tight to and behind mechanical and electrical services within plane of insulation. Leave no gaps or voids.

C. Tape joints to seal foil facing with foil tape.

3.6 SPRAY-APPLIED INSULATION INSTALLATION

A. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.7 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Repair vapor retarders as recommended by manufacturer.

END OF SECTION

SECTION 072600
VAPOR RETARDERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wall vapor retarders

B. Related Sections:
   1. Section 031500 - Concrete Accessories: Materials for underslab vapor retarders.
   2. Section 033000 - Cast-In-Place Concrete: Installation of under slab vapor retarders.
   3. Section 061000 - Rough Carpentry: Installation of wall vapor retarders at wood framing.
   4. Section 054000 - Cold Form Metal Framing.
   5. Division 07 Roofing Sections for vapor retarders used in conjunction with roof construction

1.2 SUBMITTALS

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

B. Manufacturer's installation instructions for placement, seaming and pipe boot installation

1.3 QUALITY ASSURANCE

A. Applicator: Company specializing in retarder type work with minimum 3 years' experience in application of retarder.

PART 2 PRODUCTS

2.1 VAPOR RETARDERS

A. (VR-2) Reinforced-Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft. with maximum permeance rating of 0.0507 perm.

2.2 AUXILIARY MATERIALS

A. Seam Tape at Vapor Retarders:
   1. Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
   2. Minimum: 2 inches wide.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

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

C. Verify that sleeves, ties, and other penetrating components which pass through surfaces to receive retarder are rigidly installed.

3.2 PREPARATION

A. Clean substrates of substances harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.3 INSTALLATION FOR VAPOR RETARDERS

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated.
   1. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 12 inches o.c.

C. Seal overlapping joints in vapor retarders with adhesives or vapor-retarder tape according to vapor-retarder manufacturer's instructions.
   1. Seal butt joints and fastener penetrations with vapor-retarder tape.
   2. Locate all joints over framing members or other solid substrates.

D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor-retarder manufacturer.

E. Seal end laps and terminations after each day's work with trowelled bead of mastic. Lap sides 2-1/2 inches minimum and ends 6 inches.

F. Seal ends and edges to each other and to adjoining surfaces with uniform fillet bead of sealant. Extend vapor retarder to perimeter of windows and door frames and other items interrupting plane of membrane.
   1. Imbed vapor retarder in sealant and tape edge to window or door frame.

G. Apply heavy pressure to membrane at top and bottom terminations with back of utility knife to assure positive adhesion at edge.
   1. Roll membrane firmly and completely, immediately after each sheet is applied.

H. Lap joints on sloped substrate in direction of drainage.

I. Work out air bubbles, wrinkles, and fishmouths. Firmly press sheet into place without stretching.

J. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

K. Metal deck at wall, cut vapor retarder to fit flutes of decking and imbed vapor retarder in sealant and tape edge to metal deck.

L. After installation protect membrane from damage.

M. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

END OF SECTION

SECTION 072670
MOISTURE BARRIER

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. Elastomeric wall membrane moisture barrier system

B. Related Sections
   1. Section 061000 - Rough Carpentry
   2. Section 072100 - Thermal Insulation
   3. Section 075305 - Adhered Single Ply Membrane Roofing

1.2 SYSTEM DESCRIPTION

A. (MB-1) Moisture Barrier: Self adhering rubberized laminated membrane including primers and required accessories.

B. (MB-4) Moisture Barrier: One or two-part, self-curing, rubber based liquid applied barrier, 1.5mm (60 mils) thick, complete with pre-treatment, scratch coats and sealers, cleaners and required accessories.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's instructions for surface conditioner compatibility, primer, mastic, membrane, temperature range for application of barrier materials.

B. Compatibility: Verify compatibility of barrier materials with adjacent materials.

1.4 QUALITY ASSURANCE

A. Membrane Applicator: Company specializing in retarder type work with minimum 3 years' experience in application of elastomeric membrane type moisture barrier.

B. Liquid Applied Membrane Applicator: Company specializing in liquid moisture and vapor barrier type work with minimum 3 years' experience in application of liquid type moisture barrier.

C. Pre-Installation Conference:
   1. Prior to installation of barrier, conduct pre-installation conference at project site.
   2. Attendance: Contractor, job superintendent, subcontractors, supplier and manufacturer's technical representative.
   3. Agenda: Cover installation and coordination procedures, protective measures and related conditions.

1.5 PROJECT CONDITIONS

A. Do not apply barrier during inclement weather or when air temperature is below 40 degrees F., unless manufacturer's written application instructions indicate otherwise.

B. Do not apply barrier to damp, frozen, dirty, dusty, or surfaces unacceptable to manufacturer.

1.6 WARRANTY

A. Manufacturer and installer of moisture barrier shall provide a warranty which shall provide for making good, within period of 3 years, at no cost to Owner, failures of barrier to resist penetration of water, except where such failures are:
   1. Result of structural failures of building.
   2. Cracking of membrane due to temperature or shrinkage is not considered as structural failure.

B. Manufacturer and installer of moisture barrier shall repair and make good barrier membrane and pay for and repair or replace affected or damaged materials or surfaces at no cost to Owner.

1.7 COORDINATION

A. Coordinate installation of moisture barrier with other systems including interface conditions at window and door openings, and to other waterproofing systems.

B. Coordinate installation of system over moisture barrier to protect moisture barrier from UV exposure.

PART 2 PRODUCTS

2.1 SELF-ADHERING MOISTURE BARRIER SYSTEM

A. (MB-2) Self-Adhered Air Barrier Membrane: Perm-A-Barrier VPS manufactured by Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA; a self-adhered membrane consisting of a breathable carrier film with a specially designed adhesive, which permits the transfusion of water vapor and provides superior protection against the damaging effects of air and water ingress on building structures, Product shall have the following minimum physical properties:
   1. Air Permeance, ASTM E2178: Not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water. (1.57 psf) (equal to 0.02L/sq. m @ 75 Pa)
   2. Assembly Air Permeance, ASTM E2357: Not to exceed 0.04 cfm/sq.ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/sq.m @ 75 Pa)
   3. Water Vapor Permeance, ASTM E96: Not less than 15 perms
   4. Water Resistance, AATCC-127: No less than 5 hrs at 55 cm/21 inch
   5. Breaking Force, ASTM D5034: 55 lbf MD, and 44 lbf CD
   6. Pull Adhesion, ASTM D4541: min. 15 psi to primed glass faced gypsum sheathing, min. 12 psi to primed CMU
   7. Peel Adhesion, ASTM D903: min. 5 pli to primed glass faced gypsum sheathing, min. 4 pli to Perm-A-Barrier® VPS, min. 2.5 pli to primed CMU
   8. UV Exposure Limit: Not more than 150 calendar days
   9. Water Penetration Resistance Around Nails, ASTM D1970 Modified: Pass
   10. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly

B. Transition Membrane: Perm-A-Barrier Detail Membrane manufactured by Grace Construction Product; a 36 mil (0.9mm) of self-adhesive rubberized asphalt integrally bonded to 4 mil (0.1 mm) of cross-laminated, high-density polyethylene film to provide a min. 40 mil (1.0 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming to the following:
   1. Water Vapor Transmission, ASTM E96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
   2. Air Permeance at 75Pa (0.3 in. water) pressure difference: 0.0006 L/(s.m2) (0.00012 cfm/ft2) max.
   3. Puncture Resistance, ASTM E154: 178 N (40 lbs.) min.
   4. Lap Adhesion at -4ºC (25ºF), ASTM D1876: 880 N/m (5.0 lbs./in.) of width
   5. Low Temperature Flexibility, ASTM D1970: Unaffected to -43ºC (-45ºF)
   6. Tensile Strength, ASTM D412, Die C Modified: min. 2.7 MPa (400 psi)
   7. Longation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C: min. 200%.

C. Flexible Membrane Through-Wall Flashing: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products; a 32 mil (0.8 mm) of self-adhesive rubberized asphalt integrally bonded to 8 mil (0.2 mm) of cross-laminated, high-density polyethylene film to provide a min. 40 mil (1.0 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming to the following:
   1. Water Vapor Transmission, ASTM E96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
   2. Water Absorption, ASTM D570: max. 0.1% by weight
   3. Puncture Resistance, ASTM E154: 356 N (80 lbs.) min.
   4. Tear Resistance
      a. Initiation, ASTM D1004: min. 58 N (13.0 lbs.) M.D.
      b. Propagation, ASTM D1938: min. 40 N (9.0 lbs.) M.D.
   5. Lap Adhesion at -4ºC (25ºF), ASTM D1876: 880 N/m (5.0 lbs./in.) of width
   6. Low Temperature Flexibility, ASTM D1970: Unaffected to -43ºC (-45ºF)
   7. Tensile Strength, ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)

8. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C: min. 200%

D. Primer for Primary Self-adhered air barrier membrane: Perm-A-Barrier Primer Plus manufactured by Grace Construction Products; a water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product shall have the following minimum physical properties:
   1. Solids Content (by wt.): 53-57%
   2. Solvent Type: Water
   3. VOC Content: Not to excess 1 g/L
   4. Application Temperature: 4°C (40°F) and above

E. Wall Primer for Self-adhered transition membrane and Self-adhered flexible membrane wall flashing: Perm-A- Barrier WB Primer manufactured by Grace Construction Products; a water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product to have the following minimum physical properties:
   1. Solvent Type: Water
   2. VOC Content: Not to exceed 10 g/L

F. Cleaner: As recommended by membrane manufacturer to clean surfaces to be lapped.

G. Sealant and Mastics: As recommended by membrane manufacturer to seal seam at laps and end dams.

H. Additional Manufacturers with products conforming to criteria:
   1. Carlisle Coatings & Waterproofing.
   2. Tremco.
   3. Henry.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that sleeves, ties, and other penetrating components that pass through surfaces to receive barrier are rigidly installed.

B. Verify that surfaces are free of cracks, depressions, waves or projections which may be detrimental to successful installation.

C. Ensure that exterior sheathing panels are stabilized with corners and edges fastened with appropriate screws.

D. Starting work of this Section means acceptance of substrate and site conditions.

3.2 PREPARATION

A. Seal cracks and joints with recommended material and sealant. Clean surfaces of foreign matter detrimental to installation of retarder.

B. Apply surface conditioner (primer) at rate as recommended by manufacturer.

3.3 DETAIL WORK

A. Transition and Through-Wall Flashing Membranes:
   1. Where directed by manufacturer's written instructions, apply before or after application of membrane to create a shingle effect and maintain continuity of the air barrier assembly from top to bottom of structure.
   2. Apply to beams, columns, joints, openings, and penetrations as indicated in detail drawings, overlapping edge seams minimum 2 inches and end laps minimum 4 inches.
   3. Use transition membranes to tie into opening frames, spandrel panels, floor intersections and changes in substrates.
   4. Apply in accordance with manufacturer's instructions, positioning, lapping, sealing and protecting as required.

3.4 INSTALLATION OF SHEET MEMBRANE

A. Install membrane barrier in accordance with manufacturer's instructions.

B. Seal end laps and terminations after each day's work with trowelled bead of mastic. Lap sides 2-1/2 inches minimum and ends 6 inches. Stagger end laps.

C. Apply heavy pressure to membrane at top and bottom terminations to assure positive adhesion at edge. Roll membrane firmly and completely, immediately after each sheet is applied.

D. Lap joints on sloped substrate in direction of drainage.

E. Work out air bubbles, wrinkles, and fishmouths. Firmly press sheet into place without stretching.

F. Seal ends and edges to each other and to adjoining surfaces with uniform fillet bead of sealant.

G. At wall penetrations carry moisture barrier on to penetrating element and seal to element.

H. At openings:
   1. Wrap moisture barrier into openings at windows and doors.
   2. Place separate piece of moisture barrier in each corner per manufacturer’s instructions
   3. Start at sill and wrap 12 inch wide strip of moisture barrier into opening and lap over moisture barrier on face of sheathing.
   4. Wrap both jambs similar to sill and overlap with sill.
   5. Wrap head and overlap with jambs.

I. Reinforce membrane over joints if required to maintain, whether barrier joints are static or moving.

J. At overhead applications, or on substrates such as OSB, back-nail membrane within 2 inches of edge seam; lap successive membrane minimum 2 inches, covering nail heads.

K. At terminations of vertical surfaces, turn membrane up into reglet, under counter flashing, or secure with termination bar.

L. Patch misaligned, or inadequately lapped seams, punctures or other damage with patch of moisture barrier membrane lapped 6 inches over edges of damaged area. Seal edges of patch with mastic.

3.5 PROTECTION

A. After installation, protect membrane from damage.
   1. Cover membrane barrier to avoid damage. If air and vapor barrier system cannot be permanently covered within 30 days after installation, provide temporary UV protection and contact manufacturer.

END OF SECTION

SECTION 074646
MINERAL-FIBER CEMENT SIDING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fiber-reinforced cementitious lap siding and soffit panels.
   2. Related trim, flashings, fastening and accessories.

B. Related Sections:
   1. Section 061000 - Rough Carpentry: Wood Sheathing, wood furring.
   2. Section 072100 - Thermal Insulation
   3. Section 072670 - Moisture Barrier: Vapor permeable air/moisture barrier
   4. Section 079000 - Joint Protection: Sealant at siding butt joints, perimeter, openings and dissimilar materials.
   5. Section 099000 - Painting: Prime and finish painting.

1.2 SUBMITTALS

A. Product Data: Submit in accordance with Section 013300.
   1. Provide data indicating materials, component profiles, fastening methods, jointing details, sizes and accessories.

B. Samples: Submit samples of siding 12 inches long.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage experienced installer who has completed siding projects similar in material, design, and extent to that indicated for this Project and with record of successful in-service performance.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver siding and other components so they will not be damaged. Package siding for protection against transportation damage.

B. Siding shall be stacked on edge or laid flat on a smooth, level surface. Edges and corners shall be protected from chipping. To ensure optimum performance, store siding under cover and keep dry prior to installing. If siding should become wet, allow to dry thoroughly before installing.

1.5 WARRANTY

A. Provide fifty (50) year manufacturer's written warranty. All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer and Type (FRCS-1): "Hardiplank" fiber-reinforced cementitious lap siding by James Hardie Building Products.

B. Manufacturer and Type: "Hardisoffit", non-vented, fiber-reinforced cementitious soffit panels by James Hardie Building Products.

2.2 SIDING MATERIALS

A. Hardiplank fiber-reinforced cementitious lap siding: Composed of portland cement, ground sand,

cellulose fiber, select additives and water; 5/16 inch thick; autoclaved; non-combustible.

1. Texture and width: See Section 090000 – Finishes.
2. Exposure: 6 inches.

B. Hardisoffit fiber-reinforced cementitious non-vented soffit panels: Composed of portland cement, ground sand, cellulose fiber, select additives and water; 1/4 inch thick; autoclaved; non-combustible.

1. Texture: See Section 090000 – Finishes.

2.3 ACCESSORIES

A. Nails or Screws: Hot dipped galvanized type; non-staining, size and strength per recommendations of siding manufacturer.

B. Screws: Hot dipped galvanized type; non-staining, ribbed bugle-head or equivalent, size and strength per recommendations of siding manufacturer.

C. Accessory Components: 1/4 inch lath starter strips. Trim of same material and finish as siding.

D. Sealant: Specified in Section 079000 – Joint Protection.

2.4 FINISH

A. Finish Painting: Specified in Section 099000 – Painting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that substrate surfaces and wall openings are ready to receive work.

C. Verify that air/moisture barrier is in place over sheathing as specified in Section 072670.

3.2 INSTALLATION

A. Install siding and soffits in accordance with manufacturer's instructions and recommendations.

B. Fasten siding in place, level and plumb. Nail to aligned pattern.

C. Install siding for natural watershed.

D. Position cut ends over bearing surfaces.

E. Install corner strips, closures and trim.

3.3 INSTALLATION TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch.

3.4 PREPARATION FOR SITE FINISHING

A. Site Finishing: Specified in Section 099000.

END OF SECTION

SECTION 075305
ADHERED SINGLE PLY MEMBRANE ROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Adhered EPDM elastic sheet single ply membrane roofing.
   2. Flashing, adhesive, splicing cement, lap sealant, mastic, sealer in connection with elastic sheet roofing.
   3. Roof insulation.
   4. Substrate board over metal decking.
   5. Vapor retarder, where indicated.

B. Related Sections:
   1. Section 053123 - Steel Roof Decking.
   2. Section 061000 - Carpentry: Wood blocking and nailers.
   3. Section 076210 - Sheet Metal Flashing and Trim.
   4. Section 072100 - Building Insulation: Other rigid insulation.
   5. Section 079000 - Joint Protection: Other sealants.

1.2 DESCRIPTION

A. (SA-1): Elastomeric sheet roofing directly adhered to faced roof insulation using bonding adhesive over wood decking. Roof insulation fastened to substrate using mechanical fasteners.

B. (SAT-1): Elastomeric sheet roofing directly adhered to tapered faced roof insulation using bonding adhesive on wood decking. Roof insulation fastened to substrate using mechanical fasteners.

1.3 SUBMITTALS

A. Shop Drawings: Submit in accordance with Section 013300, indicating roof size, location and type of penetrations, perimeter and penetration details, roof insulation make-up and layout that have been accepted by authorized manufacturer's representative.

B. Compliance: Submit compliance from insulation manufacturer that insulation furnished conforms to specified product.

C. Warranty: Submit 2 copies of manufacturer's warranty for elastic sheet single ply roofing.

D. Deviation to Details: If deviations to indicated details are desired, submit proposed detail changes not later than 10 days prior to bid date.

E. Manufacturer's Installation Instructions: Submit two copies in accordance with Section 013300.

1.4 QUALITY ASSURANCE

A. Roofing Applicator: Applicator shall have not less than 3 years of successful experience in installation of similar roofing systems and shall be certified in writing by manufacturer as a licensed or approved applicator.

B. Pre-Roofing Conference: Prior to installation of roofing and associated work, meet at project site with installer, roofing manufacturer, installers of related work, and other entities concerned with roofing performance. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours advance notice to participants prior to convening pre-roofing conference.

C. Fire Classification Requirements: Underwriters Laboratories Class A approval as fire-retardant for membrane at slopes over 1/4 inch per foot, and UL Design No. P512 for one hour roof/ceiling assembly as indicated.

D. Compatibility: Roofing components shall be compatible.

E. Factory Mutual Compliance: Conform to FM 1-90.

1.5 PRODUCT HANDLING

A. Deliver material in manufacturer's protective containers with labels intact and legible, and comply with manufacturer's instructions for storage and handling.

B. Handle rolled goods to prevent damage.

C. Store materials on clean raised platforms with weather protective covering.

1.6 PROJECT/SITE CONDITIONS

A. Weather Conditions: Proceed with elastic sheet single ply roofing work only when weather conditions comply with manufacturer's recommendations, and will permit materials to be applied and cured in accordance with those recommendations. Do not exceed temperature limitations recommended by roofing manufacturer.

B. Proceed with installation of elastic sheet single ply roofing only after substrate construction has been completed, and after penetrating components have been installed, so that membrane will not be penetrated or damaged by subsequent work.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, roofing accessories, roof insulation, fasteners, cover boards, vapor retarder, roof pavers, and other components of membrane roofing system.
2. Warranty Period: 15 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 ROOF INSULATION

A. Polyisocyanurate Foam Board: Closed cell polyisocyanurate foam core with laminated black glass reinforced mat facer complying with ASTM C 1289.

1. Density: 2.0 pcf per ASTM D1622.
2. Compressive Strength: 25 psi minimum per ASTM D1621 Procedure A.
3. Moisture Vapor Transmission: 1.0 perms maximum.
4. Thickness: Provide thickness and slope as indicated. Provide minimum of 5 inches at across entire roof, tapered insulation for positive drainage at crickets and saddles to be additional thickness.
5. R-Value: 5.6 design stabilized R-value according to RIC/TIMA Bulletin No. 101.

B. Insulation – General

1. Factory taper insulation to provide smooth incline of slopes as shown on drawings.
   a. Factory miter valleys, saddles and corners.
2. Multliple Layers: Furnish in not less than 2 layers.

2.2 ADHERED SINGLE PLY MEMBRANE ROOFING

A. Type and Manufacturer:

1. RubberGard EcoWhite adhered bi-laminate, 60 mil, single ply membrane roofing by Firestone Building Products.

B. Other Acceptable Manufacturers:

1. Carlisle SynTec Systems Sure-White, 60 mil.

C. Sheet Membrane: Minimum 0.060 inch thick compounded elastomeric membrane, largest sheet size possible as determined by membrane manufacturer.

D. Flashing: Minimum 0.060 inch thick uncured EPDM membrane. Provide longest pieces of flashing practicable.

E. Bonding adhesive, splice wash solvent splicing cement, lap sealant, water cut-off mastic, prefabricated pipe seals, seam tape, nite seal and pourable sealer: As recommended by sheet roofing manufacturer.

F. Splice Wash: Clear splice wash or splice primer wash.

G. Walkway Pads; Firestone QuickSeam white rubber walkway pads (size 30 inch by 30 inch by 0.300 inch thick) with QuickSeam Tape laminated to bottom.

2.3 MEMBRANE FASTENERS

A. Fasteners: Corrosion-resistant, as recommended by manufacturer, of type, length and strength required for intended use.

B. Insulation Plates: Corrosion-resistant AZ55 Galvalume steel, as recommended by manufacturer.

C. Coated screws of sufficient length to penetrate minimum one inch into wood or masonry substrate.

D. Termination Bar: 1.3 inch by 0.10 inch thick aluminum bar with integral caulk ledge.

2.4 MISCELLANEOUS

A. Sponge Tubing Expansion Joint Covers: Armstrong Armaflex.

B. Refer to Section 061000 for wood curbs, blocking, nailers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate and conditions under which elastic sheet roofing work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Verify that penetrations, expansion joints, and blocking are in place and secured and that roof drains are properly clamped into position.

3.2 SUBSTRATE PREPARATION

A. Comply with sheet membrane manufacturer's instructions for preparation of substrate to receive elastic sheet roofing. Clean substrate of dust, debris and other substances detrimental to elastic sheet roofing work.

3.3 ROOF INSULATION

A. Loosely lay roof insulation with joints staggered. Stagger joints between layers, minimum of 2 layers. Insulation joints shall be 1/4 inch or less in width. Neatly cut and fit insulation around roof penetrations and projections. Install only dry insulation and only as much insulation as can be covered same day with membrane.

B. Install tapered insulation around roof drains to provide proper slope for drainage.

C. Fiberboard Roof Insulation: Place immediately under roofing membrane with joints staggered from insulation below.

D. Secure insulation boards with fasteners and insulation plates to roof deck with, minimum 1/2 inch fastener penetration through deck using minimum of 16 fasteners per 4 foot by 8 foot board and with additional fasteners at perimeter and corners as required by FM 1-90.

3.4 WOOD NAILERS

A. Wood nailer height shall match total thickness height of insulation being used and shall be installed with 1/8 inch gap between each length of wood nailer.

B. Fasten wood nailers to deck or wall at maximum 16 inches on center to resist force of 200 pounds per foot in any direction.

C. Where nailers are required to be flush at point of contact with roofing membrane taper wood nailers.

3.5 MEMBRANE INSTALLATION

A. Loosely lay field membrane sheets over substrate without stretching and allow to relax 30 minutes before bonding, splicing or attachment. Lap sides and ends of adjoining sheets minimum of 3 inches.

B. Evenly fold each sheet back on itself so as to expose underside. Apply bonding adhesive evenly to both substrate and membrane. Apply in sequence to allow equal drying time for both exposed membrane and substrate. Allow to dry until such time when adhesive will not stick or string when touched by dry finger. Starting at fold of sheet, slowly roll coated membrane onto coated substrate evenly in order to prevent wrinkles. Compress with stiff push broom to assure full contact.

C. As protection, install additional layer of roof membrane material under roof pavers.

3.6 LAP SPLICE

A. After membrane sheet has been positioned to provide minimum overlaps as specified, top sheet at overlap shall be folded back approximately 10 to 12 inches to allow for cleaning of membrane surfaces to be spliced. Clean mating surfaces with clear splice wash or splice primer wash and allow to dry.

B. Evenly apply splice adhesive at manufacturer's recommended rate.

C. Allow adhesive to dry until it does not stick or string when touched by dry finger. Roll top sheet towards lap area until two surfaces begin to meet, and then allow top sheet to fall freely onto bottom sheet so that stretching or wrinkling of membrane is prevented. Apply hand pressure along entire length of splice. Roll entire lap with hard rubber roller, applying firm and even pressure.

D. Prime edge of completed seam with brush application of splice adhesive, and apply continuous bead of lap sealant along edge.

3.7 FLASHING

A. Install flashing at roof interruptions (walls and curbs), roof penetrations and roof perimeters, using longest flashing pieces possible. Flashing shall extend vertically minimum of 8 inches.

1. Complete splice between flashing and roof membrane before bonding or attaching flashing to vertical surfaces.
2. Install flashing at round penetrations, pipes, and conduits.

3.8 MISCELLANEOUS

A. Roof Drains: Comply with membrane manufacturer's and drain manufacturer's recommended installation procedures.

B. Walkway Protection: Install walkway pads according to manufacturer instructions, at locations shown and where required for access to roof-mounted equipment.

3.9 PROTECTION OF ROOFING

A. Upon completion of roofing (including associated work), institute appropriate procedures for surveillance and protection of roofing during remainder of construction period. Maintain roof free of nails, screws, scrap and other foreign objects. At end of construction period, or at time when remaining construction will in no way affect or endanger roofing, make final inspection of roofing

and prepare written report to Owner, describing nature and extent of deterioration or damage found.

B. Repair or replace (as required) deteriorated or defective work found at time of final inspection to condition free of damage and deterioration at time of Substantial Completion, and in accordance with requirements of specified warranty.

END OF SECTION

SECTION 076000
FLASHING AND SHEET METAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Galvanized steel sheet metal reglets.

1.2 REFERENCES

A. "Architectural Sheet Metal Manual" standard industry details by SMACNA.

1.3 PERFORMANCE REQUIREMENTS

A. Install to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking and fastener disengagement.

B. Water Infiltration: Provide installation that does not allow water infiltration to building interior.

1.4 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 013300.

B. Clearly detail shaping, jointing, length of sections, fastening, and installation details.

1.5 PROJECT/SITE CONDITIONS

A. Exercise care when working on or about roof surfaces to avoid damaging or puncturing membrane or flexible flashings.

B. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 PRODUCTS

2.1 MATERIALS

A. Type and Manufacturer (SMF-1): Ryerson ColorKlad precoated galvanized 24 gauge sheet metal, ASTM A525 G-90, coil coated with 2 coat, Kynar fluoropolymer coating in color as selected by Architect from manufacturers' standard.

B. Galvanized Sheet Metal (SMF-3): ASTM A526 or A527, 24 gauge, G-90 coating designation with both sides of metal prime painted.

C. Shop Primer: Zinc dust-zinc oxide, FS TT-P-641G, Type 1 or Type 2.

D. Anchorage: Nails and screws of hot dip zinc coated steel. Use screws where exposed anchorage is required. Screws minimum 1-1/2 inch long with neoprene washer under screw head.

E. Solder: Comply with ASTM B32, 50 percent tin and 50 percent lead, used with rosin flux.

F. Concealed Sealant: Tremco curtain wall sealant.

G. Plastic Flashing: 30 mil thick vinyl flashing by B. F. Goodrich, Wasco, Nervastral, Saraloy, Lexsuco or Sandell.

2.2 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice

the gutter thickness. Fabricate expansion joints, expansion-joint covers and gutter accessories from same metal as gutters. Shop-fabricate interior and exterior corners.

1. Gutter Profile: Style K according to cited sheet metal standard.
2. Expansion Joints: Butt type with cover plate.
3. Gutters: Fabricate from the following materials:
   a. Prefinished Galvanized Steel: 0.022 inch; 24 gauge thick.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

1. Fabricated Hanger Style: Fig 1-35C according to SMACNA's "Architectural Sheet Metal Manual."
2. Fabricate from the following materials:
   a. Prefinished Galvanized Steel: 0.022 inch, 24 gauge thick.

C. Gutter and downspout finish: Coil coated with 2 coat, Kynar fluoropolymer coating in color as selected by Architect from manufacturers' standard

2.3 FABRICATION

A. Factory-fabricate sheet metal in accordance with reviewed shop drawings and standard industry details by SMACNA in "Architectural Sheet Metal Manual."

B. Form sections crisply, square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

C. Wipe and wash clean, soldered joints, to remove traces of flux immediately after soldering.

D. Shop Primer: Clean surfaces of dirt, oil, grease and other residue in accordance with metal producer's recommendations, then apply one coat of primer on both sides of metal before installation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrate and conditions under which flashing and sheet metal work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install Work in accordance with reviewed shop drawings and Architectural Sheet Metal Manual with sharp clean breaks.

B. Lower edge of reglet edges shall be turned back into hemmed edge.

C. Securely fasten water and weatherproof. Neatly install with sharp clean breaks.

D. Butt and locked joint in metal work shall be watertight. Joints shall be lapped in direction of flow.

E. Solder joints shall be screwed or riveted to take stress, with solder acting as sealant between metal.

F. Provide lead wedges where required to hold metal firmly in place.

G. Insulate between dissimilar material with asphalt paint or other approved insulator. No dissimilar metals shall be touching. Work shall be arranged so moisture from one metal does not drain onto dissimilar metal.

H. Install work with proper allowance for expansion and contraction from thermal changes.

I. Prior to starting work, nailers and blocking shall be true to size and line and securely anchored. Do not proceed until corrections are made so straight, level, plumb and properly sized work results.

J. Carefully form reglets to conform to material dimensions as shown and according to field dimensions as verified.

3.3 CONSTRUCTION

A. Install where shown and in accordance with SMACNA standards.

B. Lapped Joints: Lap 3 inches in direction of water flow.

C. Sealant: Apply concealed sealant in accordance with requirements of Section 079000 - Joint Sealers.

D. At corners, inside or outside type, provide neat corner sections built-up in shop; with soldered joints and follow profile of adjacent metal.

3.4 CLEANING

A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

END OF SECTION

SECTION 077233
ROOF HATCHES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Prefabricated roof hatches and accessories.
   2. Ladder access safety post.

B. Related Sections:
   1. Section 075305 - Adhered Single Ply Membrane Roofing.
   2. Section 076200 - Sheet Metal Flashing and Trim: Flashing roof hatches to roof system.
   3. Section 099000 - Painting: Field painting.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.

1.3 QUALITY ASSURANCE

A. Standards: Comply with the following:
   1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
   2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Roof Hatches:
      a. Bilco Company.
      b. Milcor Incorporated
      c. Wasco Products
      d. Dur-Red Products
      e. J.L. Industries
      f. Nystrom Products.
      g. Babcock-Davis.
      h. .

2.2 ROOF HATCHES

A. Product (RH-3): Bilco Company: Type L-50T Aluminum, Ships ladder Access
   1. Size: 2 feet 6 inches by 8 feet 0 inches.

2.3 ROOF HATCH FABRICATION

A. Performance characteristics:
   1. Cover: Reinforced to support minimum live load of 40 psf with maximum deflection of 1/150th of the span or 20 psf wind uplift.
   2. Cover operation shall be smooth and easy with controlled operation throughout entire arc of opening and closing.
   3. Cover operation shall not be affected by temperature.
   4. Entire scuttle shall be weathertight with fully welded corner joints on cover and curb.

B. Cover: 11 gage aluminum with 3 inch beaded flange with formed reinforcing members. Cover shall have a heavy extruded thermoplastic rubber gasket fitted into a retainer mechanically fastened to the cover interior to assure continuous seal when compressed to top surface of curb.

C. Cover insulation: 2 inch thick polyisocyanurate rigid board, fully covered and protected by metal liner 18 gage aluminum.

D. Curb: 12 inch high; 11 gage aluminum. Curb formed with a 3-1/2 inch flange with 7/16 inch holes provided for securing to the roof deck.

1. Equipped with an integral metal cap flashing of the same gage and material as the curb, fully welded at the corners, with flashing system, including stamped tabs, 6 inch on center, to be bent inward to hold roofing membrane securely in place.

E. Curb insulation: Rigid, high-density 2 inch thick polyisocyanurate insulation on outside of curb.

F. Lifting mechanisms: Manufacturer's compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout entire arc of opening and closing. Lower tube shall interlock with flanged support shoe [for aluminum construction: welded to the curb assembly; for steel construction: through bolted to the curb assembly].

G. Hardware:

1. Hinges: Heavy pintle type.
2. Cover: Equipped with a spring latch with interior and exterior turn handles.
3. Roof scuttle: Equipped with interior and exterior padlock hasps.
4. Latch strike: Stamped component bolted to the curb assembly.
5. Cover: Automatically lock in the open position with a rigid hold open arm equipped with a 1 inch diameter red vinyl grip handle to permit easy release for closing.
6. Compression spring tubes: Constructed of anti-corrosive composite material.
7. Other hardware: Zinc plated and chromate sealed.
8. Springs: Electrocoated acrylic finish for corrosion resistance.
9. Cover hardware: Bolted into heavy gage channel reinforcing welded to the underside of the cover and concealed within the insulation space.
10. Cylinder Lock: Provide roof hatch with Deadbolt cylinder lock, keyed for interior and exterior access. Exterior lock cylinder with gasketed and threaded deck plate.

H. Finishes: mill finish aluminum.

I. Safety Post: Bilco LadderUP safety post Model LU-1 steel with yellow powder coat; telescoping tubular section that locks automatically when fully extended; upward and downward movement controlled by stainless steel balancing mechanism.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that roof hatch installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

3.2 INSTALLATION

A. Install roof hatches in accordance with manufacturer's recommendations.

B. Coordinate with installation of roofing system and related flashings. Provide weather tight installation.

C. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

D. Test operate units and adjust for proper operation.

E. Clean and lubricate joints and hardware.

END OF SECTION

SECTION 079000
JOINT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior and interior sealants.
   2. Compressible seals.

B. Related Sections:
   1. Section 033000 - Cast-in-Place Concrete: Sealant in conjunction with exterior horizontal concrete joints.
   2. Section 042001 - Unit Masonry and Related Materials
   3. Section 074243 - Composite Wall Panels: Sealant at joints.
   4. Section 076200 - Sheet Metal Flashing and Trim: Sealant concealed within sheet metal.
   5. Section 084113 - Aluminum Entrances and Storefront: Sealant at storefront entrance system.
   6. Section 088000 - Glazing: Glazing sealant.
   7. Section 092900 - Gypsum Board: Acoustical sealant at gypsum board systems.
   8. Section 093000 - Tiling: Sealant in tile work.
   9. Section 078400 - Firestopping
   10. Section 078443 - Fire-Resistant Joint Sealants

1.2 SUBMITTALS

A. Comply with Section 013300, unless otherwise indicated.

B. Product Data: Manufacturer's specifications and technical data including performance, construction and fabrication.
   1. Manufacturer's installation instructions for specific substrates on surface preparation and application for each type of sealant specified.
   2. Indicate joint dimensions and description of sealant.

C. Color Samples: Two (2) sets of manufacturer's full color range for each type of sealant specified.

D. Quality Control: Comply with Section 014500.
   1. Statement of qualification for manufacturers and installers.
   2. Statement of compliance for compatibility of sealant with adjacent materials and coatings.
   3. Field Quality Control submittals as specified in Part 3 of this Section.
      a. Field adhesion tests.
      b. Manufacturer's Field Services: For sizing of foam gasket seals and compressible seals.

1.3 QUALITY ASSURANCE

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

B. Provide materials for exterior envelope from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

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

B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.5 PROJECT CONDITIONS

A. Weather Conditions: Do not proceed with installation of sealant under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
   1. Proceed with work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.
   2. Wherever joint width is affected by ambient temperature variation, apply elastomeric sealant only when temperatures are in lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.

B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.

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

D. Compatibility and Adhesion Testing: Ascertain sealant compatibility and adhesion with adjacent materials using laboratory testing procedures.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

A. 1-Part Polyurethane Sealants: Polyurethane based one part elastomeric sealant, complying with FS- TT-S-00230C, Type II Class A, with elongation and compression of not less than 25 percent. ASTM C920, Type S, Class 25, Grade NS.
   1. Acceptable Manufacturers and Products:
      a. Sika Chemical Corporation: Sikaflex-1a.
      b. BASF Building Systems: Sonolastic NP-1.
      c. Tremco Incorporated: Dymonic.
      d. Pecora Corporation: Dynatrol I.
      e. Tremco Incorporated: Vulkem 116.

B. 2-Part Polyurethane Sealant for Horizontal Applications: Self-leveling polyurethane based 2 part elastomeric sealant, complying with FS-TT-S-00227E, Type I, Class A, with shore A hardness of not less than 30 and elongation and compression of not less than 25 percent. ASTM C920, Type M, Class 25, Grade P.
   1. Acceptable Manufacturers and Products:
      a. Tremco Incorporated: THC900.
      b. BASF Building Systems: Sonolastic SL-1 or 2.
      c. Pecora Corporation: Urexpan NR-200.

C. Low-Modulus Silicone Rubber Sealant: Silicone rubber based, one part neutral cure elastomeric sealant with plus 50 percent to minus 50 percent movement complying with FS-TT-S-001543, Class A, and recommended by manufacturer for joints.
   1. Acceptable Manufacturers and Products:
      a. General Electric: Silpruf SCS 2000.
      b. Dow Corning Corporation: 795 Building Sealant.
      c. BASF Building Systems: Sonolastic Omniseal or OmniPlus.
      d. Pecora Corporation: 864 Silicone.
      e. Tremco Construction Division: Spectrem 3.

D. Ultra Low-Modulus Silicone Rubber Sealant: Silicone rubber based, one part neutral cure elastomeric sealant with plus 100 percent to minus 50 percent movement complying with FS-TT-S-001543, Class A.
   1. Acceptable Manufacturers and Products:
      a. Dow Corning Corporation: 790 Building Sealant.
      b. Precora Corporation: 890 Silicone
      c. Tremco Construction Division: Spectrem 1.

E. Mildew-Resistant Silicone Rubber Sealant: Silicone rubber based, one part mildew resistance sealant with integral fungicide complying with FS-TT-S-001543A, Class A. Specifically recommended by manufacturer for interior joints in wet areas around plumbing fixtures and ceramic tile.
   1. Acceptable Manufacturers and Product:
      a. General Electric: Sanitary 1700 Sealant.
      b. Dow Corning Corporation: Silicone 786 mildew resistant.
      c. Tremco Construction Division: Tremsil 600.

F. Acrylic Sealants: General purpose, paintable acrylic-emulsion sealant. Caulk with approximately 12- 1/2 percent elongation complying with ASTM C834.
   1. Acceptable Manufacturers and Products:
      a. Tremco Incorporated: Acrylic Latex 834.
      b. BASF Building Systems: Sonolac.
      c. Pecora Corporation: AC-20.

G. Colors: Colors as selected by Architect from manufacturer's standard colors. Acceptance of sealant will depend on range of standard colors available for selection.

2.2 JOINT SEALANT BACKING

A. Joint Sealant Backer Rod Manufacturers:
   1. Denver Foam, Backer Rod Manufacturing, Inc.
   2. Sonneborn Sonolastic, BASF Building Systems.
   3. Construction Foam Products, Nomaco Inc..

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

C. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
   1. Provide Type C closed-cell backings at horizontal applications and at acoustically-rated assemblies.
   2. Use of Type O open-cell backing is acceptable only as approved by Architect for joints meeting the following conditions:
      a. Closed-cell backing cannot accommodate joint movement;
      b. Joint is not exposed to moisture;
      c. Joint is not horizontal;
      d. Joint is not in an acoustically-rated assembly.

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

2.3 ACCESSORIES

A. Joint Primer: Non-staining type recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive type recommended by sealant manufacturer; compatible with joint forming materials.

C. Bond Breaker: ASTM C962, pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine joint surfaces, backing, and anchorage of units forming sealant rabbet, and conditions under which sealant work is to be performed. Do not proceed with sealant work until unsatisfactory conditions have been corrected.

3.2 JOINT SURFACE PREPARATION

A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant.

B. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant application.

C. Roughen joint surfaces on vitreous coated and similar non-porous materials, wherever sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or steel wool to produce dull sheen.

D. Ensure that joint forming materials are compatible with sealant.

E. Examine joint dimensions and size materials to achieve required width/depth ratios. Use joint filler to achieve required joint depths, to allow sealants to perform properly.

3.3 SEALANT APPLICATION

A. Apply sealant in accordance with manufacturer's printed instructions. Perform work in accordance with ASTM C1193.

B. Prime or seal joint surfaces. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

C. Install sealant backer rod for liquid elastomeric sealant, except where recommended to be omitted by sealant manufacturer for application shown.

D. Install bond breaker tape wherever required by manufacturer's recommendations to ensure that elastomeric sealant will perform properly.

E. Employ only proven installation techniques, which will ensure that sealant will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides.

1. Except as otherwise indicated, fill sealant rabbet to slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between horizontal surface and vertical surface, fill joint to form slight cove, so that joint will not trap moisture and dirt.

F. Install sealant to depth as shown or, if not shown, as recommended by sealant manufacturer but within following general limitations, measured at center (thin) section of bead:

1. For sidewalks, pavements and similar joints sealed with elastomeric sealant and subject to traffic and other abrasion and indention exposures, fill joints to depth equal to 75 percent of joint width, but not more than 5/8 inch deep nor less than 3/8 inch deep.
2. For normal moving joints sealed with elastomeric sealant, but not subject to traffic, fill joint to depth equal to 50 percent of joint width, but not more than 1/2 inch deep nor less than 1/4 inch deep.

G. Interior joints not subject to movement, these are:

1. Gypsum board to masonry joints.
2. Gypsum board to hollow metal joints.
3. Gypsum board to concrete joints.

H. Do not allow sealant or compounds to overflow or flow onto adjoining surfaces, or to migrate into voids of adjoining surfaces including rough texture surfaces. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either primer/sealer or sealant.

I. Remove excess and spillage of sealant promptly as work progresses. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes.

J. Rope Wicks: Where wicks for weeping masonry cavity occur in sealant, cut wick flush with sealant face and do not seal wick ends.

3.4 FIELD QUALITY CONTROL

A. Sealant Adhesion Field Test: Comply with following.

1. Weathering Sealant Adhesion: After liquid-applied sealant is fully cured, perform sealant adhesion test according to sealant manufacturer's recommendations.

3.5 PROTECTION AND CLEANING

A. Protect joint sealers during and after curing period from contact with contaminating operations or other causes so that they are without deterioration or damage at time of Substantial Completion.

1. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

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

3.6 SCHEDULE

A. Provide sealant where indicated (SLNT) or as required to achieve a weather-tight assembly.

B. The following schedule is not intended to be all inclusive.

1. Exterior Joints at Unit Masonry to Unit Masonry: Ultra low modulus silicone sealant.
2. Exterior Joints at Unit Masonry to Aluminum Storefront Framing: Low modulus silicone sealant.
3. Exterior Joints at Fiber Reinforced Cement Siding to Composite Trim: 1 part polyurethane sealant.
4. Interior Joints at Unit Masonry to Unit Masonry: 1 part polyurethane sealant.
5. Joints subject to Pedestrian or Vehicle Traffic: Use 2 part, self-leveling polyurethane sealant.
6. Interior Joints Subject to Movement: One part polyurethane sealant.
7. Interior Joints NOT Subject to Movement: Acrylic sealant.
8. Interior Joints in Ceramic Tile Walls and Floors, and around Equipment and Plumbing Fixtures: Mildew resistant silicone rubber sealant.

END OF SECTION

SECTION 080152.91
WOOD WINDOW RESTORATION

PART 1 GENERAL

1.1 SUMMARY

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the wood window restoration as shown on the drawings and/or specified herein, including but not limited to, the following:

1. Restore existing historic wood window frames. Restoration shall include replacement of all defective elements with new wood; and stripping and consolidation of existing intact wood.
2. Replace rotted and damaged wood window sills.
3. Replace rotted, damaged or missing exterior wood trim.
4. Replace entire window where indicated on window schedule for units missing or damaged beyond repair; with new window to match existing frame and sash profiles
5. Remove cracked and damaged glazing compound, and reinstall glass with new glazing compound.
6. Replace damaged, broken, or missing glass and insulated glass units.
7. Where scheduled, replace single glazing with insulated glass units.
8. Strip, prime, paint and finish paint all existing window assemblies, including frames, stops and trim.
9. All replacement wood, including sash and trim, to be factory primed and finished.
10. Provide hardware as specified.
11. Provide pressure treated wood blocking, fillers, shims and nailers as required for secure installation.

1.2 RELATED SECTIONS

A. Historic Treatment Process – Section 013591

B. Rough Carpentry – Section 061000

C. Architectural Woodwork – Section 064000

D. Joint Sealers – Section 079000

E. Glass and Glazing – Section 088000

F. Painting - Section 099000

1.3 RESTORED WINDOW SYSTEM PERFORMANCE

A. The Work of this Section includes the restoration of existing wood windows as noted on the drawings to a high level of structural soundness, operation, visual appearance, and weather and air tightness.

1.4 QUALITY ASSURANCE

A. The Quality Standards, latest edition of the Architectural Woodwork Institute, shall apply to the work of this section. Except as otherwise indicated, provide "Premium Grade" work as defined in the above-referenced standard for all wood window work.

B. ANSI/NWWDA Standard I.S.2: Repair existing windows to meet infiltration requirements of Class A windows.

C. Window Manufacturer Qualifications: Window manufacturer to be a company which has been in business for a minimum of five (5) years and can successfully demonstrate the following:

1. A history of successfully restoring windows for a minimum of (3) historic restoration projects.
2. The physical plant capacity to produce the materials for this project as a "sole source" supplier, within the time parameters required by the Contract.
3. The physical plant capacity to factory finish the exterior and interior surfaces of all window components as required by the Contract.

D. Window Restorer Qualifications: Window installer to be a company which has been in business for a minimum of five (5) years and can successfully demonstrate the following:
   1. A history of successfully restoring historic windows for a minimum of (3) historic restoration projects.
   2. That the company employs adequate personnel on a full-time basis to insure the timely completion of the Work as specified in the Contract Documents.

E. Single Source Responsibility: All wood windows and related components are to be obtained from the same manufacturer.

F. Window Warranty: Window installer and manufacturer shall guarantee the quality of workmanship and functioning of window units for five (5) years from acceptance, providing windows are not misused or altered.

G. Hardware: Hardware shall be suitable and adapted for its required use and shall fit designated location. Should any hardware as shown, specified or required fail to meet its intended application or require additional modification to suit or fit its designated location, the Contractor is to notify the Architect in writing so the situation may be corrected in a timely manner.

1.5 SUBMITTALS

A. Product Data: For each type of complete window to be supplied, include the following:
   1. Data and cut sheets on hardware, accessories and finishes.
   2. Data on adhesives, sealants, paint system and weather-stripping components.

B. Shop Drawings: Verify window openings by field measurements before fabrication of new components and indicate measurements on Shop Drawings. For each type of new window to be restored, fully detail the work to be performed, including the following:
   1. Window schedule, listing and numbering each window, and providing for each window the size, location, and treatment work.
   2. Half size or full scale details of windows and associated window components. Include glazing, hardware and weather-stripping details. Details to indicate adjacent existing conditions.
   3. Elevations of each window type at ½” + 1'-0".

C. Samples: Provide the following:
   1. For each window construction type provide one disassembled corner of sash, including muntin, 6" long to illustrate joinery and profiles.
   2. Provide (3) 6” long samples of each type of proposed paint system applied to section of sash construction; custom colors to be selected by Architect.
   3. Provide (1) sample of each type of specified window hardware.
   4. Provide (1) sample of each type of weatherstripping.

D. Mock-Ups: Before proceeding with final fabrication of windows, prepare mock-up. Provide and install at location determined by Architect one double hung window unit, including sill, jambs, sashes, hardware, weather-stripping and finishing. Retain mock-up as quality standard for acceptance of the completed window work. If accepted, mock-up may be incorporated as part of work.

1.6 STORAGE AND PROTECTION

A. All materials when delivered to the site shall be so stored to insure proper drainage, ventilation and protection from the elements.

B. No kiln-dried materials shall be placed in any building unit unless the unit is sufficiently dry. Obtain Architect's approval before delivering such materials.

1.7 PROTECTION

A. Take all necessary precautions to protect all persons (whether engaged in the work of this Section or not) from all hazards of any kind associated with the work of this Section.

B. Take all necessary precautions to protect all property and materials (whether subject to the work of this Section or not) from any harm or damage associated with the work of this Section.

C. Perform all work of this Section in accordance with all Federal, State, and local regulations regarding the transportation, storing, handling, application, removal and disposal of the products involved.

D. Take all necessary precautions to prevent fire and spread of fire.

1.8 WALK-THROUGH AND SURVEY

A. Prior to staring restoration work, the Contractor shall walk through with the Architect, to determine the condition of each window. The Architect shall make the final determination on extent of treatment and repair.

B. Field Measurements: Provide a complete survey of the openings requiring new components per the window schedule. This survey will serve to document opening sizes, and other conditions which may not be addressed in the bid documents.

1.9 JOB CONDITIONS

A. Historic building: This property has been determined to possess intrinsic historic architectural significance and has been listed on the National Register of Historic Places. All work must shall be done in accordance with the Secretary of the Interior's Standards for Historic

B. The project work involves the renovation of a historically significant building. The building shall be treated respectfully. Existing conditions are to be carefully treated. Materials and finishes adjoining the work specified herein are to be protected from damage as a result of this work. No material or element shall be removed or disfigured unless specifically indicated on the drawings, specified herein or directed by the Architect

C. Environmental conditions: Work during inclement weather may be performed only if "adequate protection' from the elements is provided such that the building interior and its contents are not exposed to the elements and subject to same.

1.10 WARRANTY

A. General Warranty: The special 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. Special Warranty: The Contractor shall submit a written warranty, acknowledged by the Window Manufacturer, agreeing to replace or repair window sashes or components that fail in materials or workmanship within the warranty periods specified below. Repair or replacement will include the removal of the failed components, installation of repaired or new components, and repairs to adjacent areas of the building which may have to be disturbed to affect the repair. Failures include, but are not limited to the following:

1. Structural failures, including excessive deflection, water leakage, air infiltration, condensation, joint separation.
2. Faulty operation of sashes and hardware.
3. Deterioration of the exterior finish beyond normal weathering.
4. Deterioration of the interior or exterior finishes caused by failure of other window components.

C. Warranty Periods: The following warranty periods apply under "Special Warranty":

1. Windows: Five (5) years from acceptance.
2. Hardware: Five (5) years from acceptance.
3. Exterior paint finish: Five (5) years from acceptance.
4. Installation workmanship: Five (5) years from acceptance.
5. New insulated Glass seal failure: Ten (10) years from acceptance.

PART 2 PRODUCTS

2.1 WOOD WINDOWS, GENERAL REQUIREMENTS

A. The grades of all materials under this section shall be as defined by the rules of the recognized association of lumber manufacturers producing the materials specified. Materials for millwork shall conform to, or exceed, the requirements of "Premium Grade, Class 1" as established by Quality Standards of the Architectural Woodwork Institute. Where conflicts occur between these standards and this Specification, the more stringent requirement shall govern in each case.

B. Lumber shall bear the grade and trademark of the association and under whose rules it is produced, and a mark of mill identification.

C. Work that is to be finished or painted shall be free from defects or blemishes on surfaces exposed to view that will show after the finish coat of paint is applied. Any materials which are in any way defective and not up to specifications for quality and grade, or otherwise not in proper condition, shall be rejected.

D. All glues shall be non-staining waterproof types as manufactured by:
   1. 3M Company
   2. Pittsburgh Plate Glass Company
   3. Borden Company
   4. Or equal manufacturer as approved by the Architect.

E. All carpentry and millwork materials exposed to the weather or in contact with masonry or other dissimilar materials shall be preservative treated, including all field cuts and fittings.

2.2 FINISH CARPENTRY AND MILLWORK MATERIALS

A. Quality Standards: The Quality Standards of the Architectural Woodwork Industry (AWI), shall apply and by reference are made a part of this specification.

B. Quality Grade: Material and workmanship of all woodwork shall conform to the Premium Grade requirements of the AWI Quality Standards.

C. Joinery of window rails, stiles and cross-rails shall be fabricated to match existing, or AWI Premium Grade, whichever is more stringent.

D. All millwork exposed to the weather or in contact with masonry or other dissimilar materials shall be given wood preservative treatment as specified herein.

E. All work shall be back painted and finish to match existing.

F. Wood Species: Clear Swietenia macrophylia (Honduras Mahogany) heartwood, procured from responsibly managed sources. Wood to be free of fingerjoints, kiln dried to a moisture content of 6-8% at the time of fabrication. Windows are to be delivered with a factory applied finish over a factory applied primer on the exterior and interior. Surfaces which are not visible are to be back primed.

G. Fasteners: Comply with NWWDA I.S. 2-93 for fabrication in accordance with manufacturer’s recommendations and accepted industry standards.
   1. All fasteners used to attach frame components to be stainless steel.
   2. All fasteners used to attach hardware to be solid brass.
   3. Removable sash stops to be attached with solid brass screws and grommets.

H. Weather-Stripping: Provide full weather-stripping at all windows. All window frames and sash shall have weatherstripping of zinc cut across the grain, compression type or sliding type singly or in combination as required to enable the window to meet the air infiltration and water penetration requirements for the performance levels specified herein.
   1. Zinc weatherstripping as manufactured by:
      a. Zero International, Bronx, NY
      b. Accurate Weatherstrip Inc. Mt.Vernon, NY
      c. Dorbin Metal Strip Manufacturing Co, Cicero, IL
      d. Or approved equal complying with specified requirements.

2. Provide Series 6 for double-hung windows, Series 30 for hinged, pivoted, transom and fixed windows. Head strips: 12 gage. Jamb strips: 9 gage. Flat strip at meeting rails: 9 gauge doubled. Hook strip at meeting rails: 10 gage. Sill strips: 16 gage. Jamb strips: full width of thickness of sash with return flange at jamb parting strip and extended under inside stop and long enough to prevent sash from running out of strips when the sashes are completely up or down. Head and sill strips: folded and with double base. Meeting rail strips: interlocking. Jamb, head and sill strips: coped at intersections. Jamb strips: nailed 16" o.c. All other strips: secured with nails, 2" o.c.; stagger those at head and sill. Strips shall be so fitted that, when lower sash is raised 6" or upper sash dropped 6:, there shall not be more than 1/8" sidewise movement. If necessary to pack jamb strips in fitting, it shall be done with an approved waterproof material.
3. Compression and Sliding Type Weatherstripping:
    a. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when sash is closed.
        1) Molded PVC gaskets complying with ASTM D 2287.
        2) Molded, expanded, EPDM or neoprene gaskets complying with ASTM C 509, Grade 4.
    b. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701.2.
        1) Provide weather stripping with integral, centerline barrier fin of semi-rigid, plastic, polypropylene sheet.
4. Grooving: Grooves shall not be more than 1/32" wider than thickness of folded strip.

2.3 WOOD PRESERVATIVE

A. Wood preservative shall be brush applied or dipped treatment of zinc napthenate in conformance with standards of the American Wood Preservers Association, and with all applicable requirements of governing authorities having jurisdiction.

B. Wood preservatives shall be compatible with clear finishes : acceptable manufacturers:
1. "Cuprinol No. 20 Clear Wood Preservative" as manufactured by Darworth Co., Avon, CT 06001, and shall be compatible with clear finishes.
2. "F&P Finish and Preservative" by Wolman Wood Care Products / Rustoleum Corp.
3. "TWP 300 Series" by Gemini Coatings
4. Or approved equal complying with specified requirements.

2.4 HARDWARE

A. General: Window hardware shall consist of all existing hardware and fasteners. Restore all existing as specified herein and provide new to match existing where hardware and fasteners are missing or not salvageable at shutters.

B. Provide solid brass hardware engineered, fabricated, and installed to withstand heavy institutional use without failure.

C. Manufacturers are listed for each type of hardware or weather-stripping required. Provide either the product designated or approved equivalent. All of the following items (brass unless otherwise noted) may be ordered from the following manufacturer:
1. The Architectural Resource Center 557 Old Turnpike Road Northwood, NY 03261 (800) 370-8808
    a. Double Hung Windows
        1) No. 4217 meeting rail sweep sash lock – two per sash.
        2) No. 222 mortised sash lift – two per sash.
        3) Sash chain: stainless steel or red metal solid bronze chain; tensile strength not less than 500 lbs.
        4) No. 6114 SBS sash pulley.
        5) Provide sash weights and chains sized as required to ensure smooth operation of window units.
        6) Provide brass grommets at interior sash stops.
2. Miscellaneous:

a. Provide two (2) spare pairs of sash lifts for maintenance purposes.
b. Provide all types of spare weather-stripping for maintenance purposes.
c. Provide sash weights (replacement and/or modified existing) for proper balancing so that operating force will not exceed 35 lbs.

2.5 GLASS AND GLAZING

A. Where glass is broken or damaged, replace with glass to match existing window, either (depending on location) insulating glass units or tempered ¼" thick clear glass. Insulated glass units to be 5/8" thick insulating glass (Glass type GL-24T or GL-25 per Section 08800). Install glass in accordance with GANA "Glazing Manual."

B. Where window schedule indicates existing single glazing use existing historic salvaged glass.

2.6 EPOXIES, ADHESIVES, GLAZING COMPOUND, FASTENERS

A. Epoxy adhesives and consolidants shall be products of:
1. Sika Corporation, Lyndhurst, NJ, 201-933-08800.
2. Abatron, Inc., Gilberts, IL, 312-426-2200.
3. Philadelphia Resins, Inc., Montgomeryville, PA.
4. Or approved equal complying with specified requirements.

B. Wood filler shall be:
1. Woodepox #1 by Abatron, Inc., Gilberts, IL, 312-426-2200,
2. Epoxy Wood Filler by Protective Coating Company (PC Products Inc.)
3. Mas Wood Flour Filler by Mas Epoxies Inc.
4. Or approved equal complying with specified requirements.

C. Epoxy consolidant shall be low modulus, low viscosity two-component epoxy resin:
1. Sikadur-Lo-Mod LV (Sikastix 321) or
2. Abatron Liquid Wood.
3. Mas Low Viscosity Epoxy by Mas Epoxies Inc.
4. Or approved equal complying with specified requirements.

D. Adhesives for window fabrication and repair shall be non-staining waterproof, aliphatic resin type glue:
1. 3M Company,
2. Pittsburgh Plate Glass Company,
3. Borden Company
4. Or approved equal complying with specified requirements.

E. Glazing compound (glazing putty) shall be:
1. Dap Glazing Compound by Dap Products, Inc.,
2. Dual Glaze Glazing Compound by Abatron Inc.
3. Multi Glaze Glazing Compound by SarcoSeal, Inc.
4. Or approved equal complying with specified requirements.

F. Paint stripper: Use non-flammable materials when they will produce satisfactory results. Provide one of the following, or an approved equal:
1. "Enviro Strip #4" by Pro So Co., Inc.
2. "Greensolv 273G" by Greensolv, Inc.
3. "ABR Fast Finish Remover" by American Building Restoration Products Inc.
4. Or approved equal complying with specified requirements.

2.7 FABRICATION OF NEW WINDOW SASH

A. Comply with NWWDA I.S. 2-93 for fabrication.

B. Fabricate window sashes with mortise and tenon construction. Sash joints to be sealed with silicone and pinned using stainless steel pins. Sash joints to be flush at junctures of stiles and rails, sashes to be 1 3/4" thick.

C. All sashes to be interior glazed, with removable wood stops.

D. All work shall comply with AWI Section 1000, Premium Grade for new millwork. Repair existing millwork exactly matching existing joinery, profiles and dimensions.

E. Work shall be fabricated to designs, dimensions, and details shown on the Drawings and approved shop drawings, and shall replicate existing profiles except where specifically indicated otherwise.

F. All millwork exposed to weather or in contact with masonry or other dissimilar materials shall be given wood preservative treatment.

G. All new work shall be primed and finish to match existing.

2.8 EXTERIOR BRICK MOULD AND WINDOW TRIM PARTS

A. All casings and other window parts to exactly replicate the original profiles of the existing windows.

2.9 PAINT FINISH

A. All new wood window elements are to be factory finished, with touch up painting applied in the field. Existing wood elements are to be field painted.

B. Manufacturer:
   1. "Benjamin Moore Alkyd Primer" by Benjamin Moore Inc.
   2. "Glidden Prime Coat Exterior Alkyd Primer", by Glidden Paints Inc.
   3. XIM 400W ES White Alkyd Primer", by XIM Products Inc.
   4. Or approved equal complying with specified requirements.

C. Materials:
   1. Provide products which meet NYS Part 205-VOC requirements for applications outlined herein.
   2. Provide best quality grade of various types of coatings as regularly manufactured by paint materials manufacturers.
   3. Use only thinners approved by paint manufacturer for applications intended and use only within recommended limits.
   4. Provide filler for open-grain wood as required for proper paint finish.
   5. At pulley stiles of frames, parting strips and edges of sashes, apply two coats of pure linseed oil, well brushed in.
   6. Coat wood surfaces with water repellent, preservative solution to prevent fungi and micro-organism development that causes rot and decay. Apply treatment after machining, in accordance with the latest revision of NWWDA Industry Standard I.S. 4 – "Water Repellent Preservative Treatment for Millwork."
   7. Provide tannin block prior to application of paint.
   8. Paint Schedule
      a. Exterior Wood: Gloss
         1) Sealer: Varnish-type surface Sealer
         2) Prime Coat: Exterior Alkyd Primer Coating 2.2 Mils/DFT
         3) Two Coats: Exterior Alkyd Oil Paint 2.0 Mils/DFT each coat
      b. Interior Wood: Semi-Gloss
         1) Prime Coat: Interior Latex Primer Coating 2.2 Mils/DFT
         2) Two Coats: Interior Latex Paint 2.0 Mils/DFT Each Coat

PART 3 EXECUTION

A. Field Conditions
   9. Take all necessary field measurements and verify all installation conditions prior to ordering and fabrication of material.
   10. Coordinate work with Owner for requirements for temporary protection at window openings during window restoration operations.

D. General restoration sequence - each window
   1. Inspect each window unit with the Architect, whose decisions on repair or replacement measures will be final.
   2. Remove cracked or damaged glazing compound and carefully remove glass or insulated glass units.
   3. Thoroughly strip coatings and repair frame in place.
   4. Prime and paint unit (interior and exterior).
   5. Interior and exterior paint colors shall be different.
   6. Install new weatherstripping.

E. Wood window restoration - general
   1. General: Repair all frames, sills, and sashes shown on the Drawings using methods specified in this section. Restoration work includes all work necessary and is not limited to specific items noted on the Drawings.
   2. Performance Requirements for Wood Window Restoration
      a. Conditions of Existing Windows: The Contractor is required to inspect each window and report to the Architect any discrepancies between the Drawings and actual conditions.
      b. Wood Components scheduled to remain, General: Replace all missing, warped or otherwise defective rotted trim, stops, and parting beads of all windows. Finished windows shall be fully intact, structurally sound, weathertight windows. Patch holes, indentations, gouges, etc. using epoxy wood filler for holes less than 1" x 1" x 1/2" deep and wood dutchmen for holes larger than 1" x 1" x 1/2" deep.
      c. Sills: Replacement sills shall match existing design and profiles.

F. Frame, sill, and mullion restoration
   1. Preparation
      a. Remove all dirt and debris from frame, including loose dirt inside window and door frames accessible from jamb access panels.
      b. Remove all extraneous nails, staples, bolts, hooks, window washer bolts, etc. from windows and wood trim.
      c. Protect frame and opening from weather. Dry all wood to moisture content below 17%.
      d. Strip paint from existing frames to remain. All pieces requiring epoxy consolidation shall be stripped of all paint.
   2. Epoxy Repairs of Rotted Frame Components
      a. For Wood Deterioration Less Than 3/4" Deep (test with an ice pick using moderate hand pressure): Brush apply epoxy resin on to clean wood surfaces. Protect adjacent masonry and other surfaces by masking entire area surrounding sill.
         1) Follow manufacturer's instructions for mixing of components, application temperatures, and material handling.
         2) Apply heavy coat of epoxy resin and allow to soak into wood. Apply additional coat while previous coat is uncured to completely saturate the deteriorated areas of wood.
         3) Fill depressions, voids, gouges, and cracks with epoxy filler and sand to smooth surfaces.
      b. For Wood Deterioration Greater than 3/4" Deep
         1) Drill three-eighths inch (3/8") diameter holes through approximately 90% of thickness of wood from top. Holes shall be staggered, on approximately three inch (3") centers.
         2) Protect all surrounding building elements from spillage of epoxy with polyethylene sheets and tape.
         3) Pour low modulus, low viscosity epoxy resin into each hole until hole has been filled. As epoxy is absorbed into the wood, top off holes with epoxy as required until all holes will accept no more. (If the wood being treated contains water, the water will be forced out by the epoxy without affecting the procedures.)
         4) Brush the remaining weathered portions of the top and front of the wood element with epoxy. Repeat brush application until all surfaces being treated are saturated with epoxy and are flush and smooth.
         5) Finish to match original configuration. Thoroughly sand cured epoxy to provide proper surface for bond of finish. (Curing time varies with ambient temperature and product used.)

6) Protect epoxy from prolonged exposure to ultraviolet light. Prime paint shall be applied within 48 hours after cure.

c. Filling of Holes, Cracks, Depressions, and Gouges with Epoxy Filler: Mix and apply epoxy wood filler in accordance with manufacturer's recommendations. Fill flush with surface of wood, matching profile of original wood. Sand to smooth surface after filler is completely cured.

3. Frame Repair Procedure
   a. Inspect all frames components for condition. Where severely deteriorated, disassemble and remove deteriorated components and replace with replicate components.
   b. Dutchman Repairs: Where practicable, repair deteriorated, split, or missing wood with dutchman repairs.
      1) Neatly cut out defective materials and enough sound wood to bond dutchman to sound substrate. Form a prismatic void in existing wood with square corners and edges. Cut dutchman to exactly fit void, with exposed portion matching original profile of woodwork, and grain of dutchman insert parallel to original wood grain direction.
      2) Secure dutchman with waterproof adhesive and clamp (of form frames, nail) in place until glue is set.
      3) Where necessary to cut off an end of a component and install dutchman, use a diagonal scarf joint for end-to-end joints.
   c. Tighten loose and open joints in frame using waterproof glue and finishing nails properly countersunk. Fill all joints which cannot be closed without dismantling the window and fill all other holes in wood with non-shrinking epoxy wood filler.
   d. Fill all miscellaneous holes, cracks, and open joints in woodwork with epoxy wood filler.
   e. Sand to smooth surface.
   f. Treat all unpainted exterior and concealed wood surfaces with wood preservative. Liberally apply two coats to all surfaces. Spray treat concealed head and jamb members. Allow 24 hours between coats and three (3) days prior to painting.

G. Installation of sash
   1. Install sash in original frames after restoration and priming of frames. Do not allow units to be installed in non-original frames.
   2. Install replicate parting beads in cleaned dados, cut to proper length, with top and bottom mortise to fit securely in position without fasteners.
   3. Install weatherstripping, and install sash in frames.
   4. Install repaired inside stops, adjusting for proper fit.

H. Adjust and clean
   1. Clean glazing on both faces before Substantial Completion. Comply with glazing material manufacturer’s recommendations for final cleaning and maintenance. Remove nonpermanent labels from glass surfaces.
   2. Adjust and check each operating item of hardware and each window to ensure proper operation and function of every unit.
   3. Lubricate moving parts including existing pulleys and hinges with machine oil. Replace elements which cannot be adjusted and lubricated to operate freely and smoothly for the application made.
   4. Clean new and existing finish hardware.

I. Painting
   1. Prime and paint all windows as specified in Section 099000, interior and exterior.

END OF SECTION

SECTION 083613
SECTIONAL DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Electrically operable energy-efficient metal sectional overhead doors (SD).
   2. Electrical wiring from makeup box to electric operators and control stations.
   3. Operators, control stations, and remote-control transmitters.

B. Related Sections:
   1. Section 055000 - Metal Fabrications: Steel channel framing for door openings and steel plate at wall for shaft mounting.
   2. Division 26 - Electrical: Service to makeup box located on electric door operators. Empty conduit from control stations to door operators.

1.2 SHOP DRAWINGS AND PRODUCT DATA

A. Submit shop drawings and product data in accordance with Section 013300.
   1. Indicate pertinent dimensioning, general construction, component connections and details, anchorage methods, hardware locations and installation details.

B. Samples: Submit samples of door finish in accordance with Section 013300, for color selection and appearance acceptance.

1.3 DELIVERY OF MATERIALS

A. Deliver doors in manufacturer's packaging complete with installation instructions.

1.4 QUALITY ASSURANCE

A. Provide each sectional overhead door as complete unit produced by one manufacturer, including frames, sections, brackets, guides, tracks, counterbalance mechanisms, hardware, operators and installation accessories, to suit openings and head room allowable.

B. Wind Loading: Design and reinforce sectional overhead doors to withstand 20 lb per sq ft wind loading pressure.

C. Installation: By overhead door manufacturer's authorized installer.

D. Label: Provide on electrical equipment.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer and Type: Motor-operated (Manual) ThermaSeal Standard insulated metal sectional doors by Raynor Garage Doors.

B. Other Acceptable Manufacturers:
   1. Overhead Door.
   2. Wayne/Dalton.
   3. Midland Garage Door Manufacturing.
   4. Clopay Building Products.

2.2 TYPE

A. Standard lift insulated overhead sectional doors with flush steel door panels, and electric operation.

B. Electrically Operated Overhead Sectional Doors: Manually operable in case of power failure.

2.3 COMPONENTS AND MATERIALS

A. Door Sections: Steel sandwich construction, 1-3/4 inch thick, 25-gauge exterior skin and 26-gauge interior skin with injected polyurethane foam insulated core, stucco embossed hot-dipped galvanized (G60) steel complying with ASTM A653, with galvanized steel horizontal hinge reinforcement strips and end stiles.

B. Mounting: Lap jamb angle mounting as recommended by door manufacturer.

C. Insulation: Polyurethane foam with R-value of 16.4.

D. Section Joint Seals: Interior and exterior skins separated by continuous hot melt seal to form effective thermal break and complete weather-seal along section joint.

E. Finish and Color: Exterior skin with 2-coat factory finish, one coat primer and Kynar type finish coat as selected by Architect.

F. Glazed Panels: Full infill panel insulating glass; 2 panes of 3/16 inch glass; set in place using moldings consistent with door panel construction.

G. Tracks: Galvanized steel; 3 inches wide; continuous vertical mounted with galvanized steel angles of same gage as tracks; horizontal length.

H. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; full floating hardened steel ball bearing rollers; located at every sill and rail meeting point.

   1. Rollers: 3 inch diameter nylon rollers as recommended by door manufacturer.

I. Weatherstripping: Fitted at bottom of doors, full length; double contact resilient, flexible vinyl strip type.

J. Lift Mechanism: Warranted 100,000 cycle torsion spring on cross head shaft, with braided steel lift cables and tamper proof counter.

K. Electric Operators: UL approved; center mounted draw bar assembly: 12 inches per second operation; motor size and type as recommended by door manufacturer for door sizes indicated, adjustable friction clutch double shoe brake system actuated by independent full line voltage solenoid controlled by motor starter; fully enclosed positive gear driven limit switch; fully enclosed magnetic cross line reversing starter.

L. Control Station: Standard 3 button (open-close-stop) type, for each electric operator; 24 volt circuit; surface mounted.

M. Automatic Reversing: At bottom of doors, full width; electromechanical type; wired to stop, reverse door upon striking object; neoprene covered to provide weather seal.

N. Remote –Control Transmitters: As recommended by door and opener manufacturer. Provide total of 5 transmitters for Owner’s use.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install overhead sectional doors complete with electric operators and controls, in accordance with reviewed shop drawings and manufacturer's recommendations. Coordinate installation with electrical service.

B. Fit, align, and adjust complete door assembly level and plumb, and to provide smooth operation.

C. Securely brace overhead door tracks suspended from structure. Secure tracks to structural members only.

D. Upon completion of installation, including work by other trades, lubricate, test and adjust doors to operate easily, free from warp, twist, or distortion and fitting weather tight for entire perimeter.

END OF SECTION

SECTION 084113
ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aluminum exterior entrance doors and frames (AFS).
   2. Aluminum storefront and window-wall framing system.
   3. Anchors, brackets, reinforcement and attachments.
   4. Sealant at aluminum entrances and storefronts.
   5. Field Testing

B. Related Sections:
   1. Section 079000 - Joint Protection: Other sealants.
   2. Section 084114 - Aluminum Interior Doors and Frames.
   3. Section 087100 - Door Hardware.
   4. Section 088000 - Glazing.

1.2 DESCRIPTION

A. Low-rise aluminum thermally broken exterior entrance doors and framing and storefront framing systems designed to accept 1 inch glazing material.
   1. Profile (AFS-2): As indicated on drawings.

1.3 SYSTEM PERFORMANCES

A. General: Provide exterior entrance and storefront assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below as demonstrated by testing manufacturer's corresponding stock systems according to test methods designated.
   1. Thermal Movement: Allow for expansion and contraction resulting from ambient temperature range of 120 degrees F.
   2. Thermally Broken Construction: Provide systems that isolates aluminum exposed to exterior from aluminum exposed to interior with material of low thermal conductance.
   3. Wind Loading: Provide capacity to withstand wind loading shown on Structural Drawings.

B. Deflection of Framing Members: At design wind pressure, as follows:
   1. Deflection Normal to Wall Plane: Limited to [edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

C. Transmission Characteristics of Framing: Comply with requirements indicated below for transmission characteristics and test methods.
   1. Air Infiltration: Air infiltration of not more than 0.06 CFM per square at 6.24 psf of fixed area unless ASTM E283, applicable AAMA methods or manufacturers data requires a higher pressure.
      a. Limit air infiltration to 0.10 cu. ft/min/lineal foot of sash crack for operating sash.
   2. Water Leakage: No uncontrolled water penetration per ASTM E331 and AAMA 503 at pressure differential of 12.00 psf.
   3. Thermal Resistance of Wall System (Excluding Vision Glass Areas): U-value of 0.65 BTU/sq ft. per AAMA 1503.1.

4. Condensation: Achieve not less than 60 CRF per AAMA 1503 so condensation is not formed on interior frame and interior window surfaces at following conditions unless project humidity conditions and specific location conditions are more severe per ASHRAE Handbook of Fundamentals, Weather Data and Design Conditions.
    a. Interior Air Temperature: 75 degrees F.
    b. Interior Humidity: 30 percent
    c. Exterior Air Temperature: minus 10 degrees F.
    d. Wind Speed: 15 miles per hour unless other indicated.

D. Transmission Characteristics of Entrances: Provide entrance doors with jamb and head frames which comply with requirements indicated below for transmission characteristics and test methods.
1. Air Leakage: Air infiltration per linear foot of perimeter crack of not more than 0.50 CFM for single doors and 1.0 CFM for pairs of doors per ASTM E283 at pressure differential of 1.567 psf.
2. Thermal Transmittance: U-value of not more than 0.93 Btu per AAMA 1503.
3. Condensation Resistance: Not less than 48 CRF per AAMA 1503.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, standard details, and installation recommendations for components of aluminum entrances and storefronts required for project.
1. Include test reports certifying that products have been tested and comply with performance requirements.

B. Shop Drawings: Submit shop drawings in accordance with Section 013300 for fabrication and installation of aluminum entrances and storefronts.
1. Include elevations, detail sections of typical composite members, hardware mounting heights, anchorages, reinforcement, expansion provisions, and glazing.

C. Samples: Submit samples of each type and color of aluminum finish in accordance with Section 013300.
1. Where normal color and texture variations are to be expected, include 2 or more units in each set of samples showing limits of such variations.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage experienced installer who has completed installations of aluminum storefront and entrances similar in design and extent to those required for the project and whose work has resulted in construction with record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver aluminum entrance and storefront components in manufacturer's original protective packaging.

B. Store aluminum components in clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in manner to permit circulation of air.
1. Stack framing components in manner that will prevent bending and avoid significant or permanent damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Type and Manufacturer: Kawneer Trifab Versiglaze 451T thermally broken aluminum storefront system.

Entrance Doors: Kawneer AA 425 thermal aluminum entrances.

B. Other Manufacturers: Contingent on meeting or exceed specified requirements: Wausau Windows, Oldcastle/VistaWall Architectural Products, Tubelite Incorporated, EFCO Incorporated.

2.2 MATERIALS AND ACCESSORIES

A. Exterior Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B221 for extrusions, ASTM B209 for sheet/plate.
   1. Aluminum Doors: Heavy duty with 4 inch stiles and top rails and 6-1/2 inch bottom rails with continuous steel reinforcing at each hinge stile. Weld four corners of door and provide with continuous steel rods at top and bottom rails fixed to stile with plated and lock nuts.

B. Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum components.
   1. Provide exposed fasteners to match finish of members and hardware being fastened.
   2. (Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal).
   3. Provide Phillips flat-head machine screws for exposed fasteners.

C. Concealed Flashing: Dead-soft stainless steel, 26 gauge minimum, or extruded aluminum, 0.062 inch minimum, of alloy and type selected by manufacturer for compatibility with other components.

D. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible; otherwise, non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A386.

E. Concrete/Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A386.

F. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compounded for 30 mil thickness per coat.

G. Compression Weatherstripping: Manufacturer's standard replaceable stripping of either molded neoprene gaskets complying with ASTM D2000 or molded PVC gaskets complying with ASTM D2287.

H. Sliding Weatherstripping: Manufacturer's standard replaceable stripping of wool, polypropylene, or nylon woven pile, with nylon fabric of aluminum strip backing, complying with AAMA 701.2.

I. Accessories: Closures, reinforcement and anchorage as indicated and recommended by entrance manufacturer. Provide concealed reinforcement for hardware. Continuous reinforcing steel channels 3/16 inch thickness with zinc-chromate coating. Provide steel plate reinforcement for closer attachment.

J. Sealant and Backer Rod: As specified in Section 079200 - Joint Protection.

2.3 FABRICATION

A. Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
   1. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
   2. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work in manner which prevents damage to exposed finish surfaces.
      a. For hardware, perform these operations prior to application of finishes.

B. Welding: Comply with AWS recommendations to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

C. Reinforcing: Install reinforcing as necessary for performance requirements.

D. Dissimilar Metals: Separate dissimilar metals with bituminous paint or other separator which will prevent corrosion.

E. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

F. Fasteners: Conceal fasteners wherever possible.

G. Weatherstripping: For exterior doors, provide compression weatherstripping against fixed stops; at other edges, provide sliding weatherstripping retained in adjustable strip mortised into door edge.

1. Provide EPDM/vinyl blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.
2. At interior vestibule doors and other locations without weatherstripping, provide neoprene silencers on stops to prevent metal-to-metal contact.

2.4 STOREFRONT FRAMING SYSTEM

A. General: Provide inside-outside matched resilient flush-glazed system with provisions for glass replacement. Shop-fabricate and pre-assemble frame components where possible.

B. Thermal-Break Construction: Fabricate aluminum storefront framing system with integrally concealed, low conductance thermal barrier, located between exterior materials and exposed interior members, in manner which eliminates direct metal-to-metal contact.
   1. Provide manufacturer's standard construction that has been in use for similar projects for period of not less than 3 years.
   2. Provide manufacturers high performance thermally broken sub-sill flashing at all locations.
   3. Provide manufacturers high performance thermally broken head compensation channel designed to meet deflection limits.

C. Sealant Back Stop Containment: At perimeter, provide not less than 1-1/2 inch continuous flush metal to permit sealant back-stop containment.

2.5 STILE-AND-RAIL TYPE ALUMINUM DOORS

A. Frame: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts, or fabricate with structurally welded joints, at manufacturer's option.

B. Glazing: Fabricate doors to facilitate replacement of glass or panels, without disassembly of door stiles and rails.
   1. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.

2.6 ALUMINUM DOOR FRAMES

A. Fabricate thermally improved tubular and channel frame assemblies, as indicated, with either welded or mechanical joints in accordance with manufacturer's standards, reinforced as necessary to support required loads.

2.7 FINISHES

A. High Performance Pigmented Organic Coating: AA-C12C423R1x (cleaned with inhibited chemicals, conversion coated with acid-chromate-fluoride-phosphate treatment, and painted with organic coating specified below). Prepare, pre-treat and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.
   1. Fluoropolymer Coating: 2-coat Hylar 5000 or Kynar 500 PVDF coating complying with AAMA 2605, minimum 70 percent Hylar 5000.
   2. Custom color as selected by the Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems.

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

3.2 PREPARATION

A. Field Measurement: Wherever possible, take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of work.

B. However, proceed with fabrication and coordinate installation tolerances as necessary when field measurements might delay work.

3.3 INSTALLATION

A. Comply with manufacturer's instructions and recommendations for installation of aluminum entrances and storefronts.

B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels.
   1. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

C. Construction Tolerances: Install aluminum entrance and storefront to comply with following tolerances:
   1. Variation from Plane: Do not exceed 1/8 inch in 12 feet of length or 1/4 inch in any total length.
   2. Offset from Alignment: Maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
   3. Diagonal Measurements: Maximum difference in diagonal measurements shall not exceed 1/8 inch.
   4. Offset at Corners: Maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.

D. Drill and tap frames and doors and apply surface-mounted hardware items, complying with hardware manufacturer's instructions and template requirements.
   1. Use concealed fasteners wherever possible.

E. Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weather tight construction.
   1. Comply with requirements of Section 079000 - Joint Protection for sealants, fillers, and gaskets.

F. Install perimeter sealant and backing in accordance with Section 079000 - Joint Protection.

3.4 FIELD TESTING

A. Field test installed glazed aluminum curtain wall unit in accordance with AAMA 503 (pressure chamber with water spray apparatus), except that reduction of performance criteria for field testing is not allowed. Testing must be performed at the specified pressure.

B. Perform air infiltration testing in accordance with applicable AAMA field method except reduction of performance criteria for field testing is not allowed.

C. Perform not less than two tests in accordance with AAMA perform testing until test results from two tests are satisfactory.

D. Include in test area adjacent wall materials so seal between window framing and rough opening is included in test.

E. Perform testing by approved independent testing laboratory acceptable to Architect.

3.5 ADJUST AND CLEAN

A. Adjust operating hardware to function properly, without binding, and to prevent tight fit at contact points and weatherstripping.

B. Clean completed system, inside and out, promptly after erection and installation of glass and sealants.
   1. Remove excess glazing and joint sealants, dirt, and other substances from aluminum surfaces.

C. Institute protective measures and other precautions required to assure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

SECTION 085113
ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Extruded aluminum windows with fixed frames and operating sash.
   2. Glass and glazing.
   3. Operating hardware and insect screens.

B. Related Sections:
   1. Section 013591 – Historic Treatment Process
   2. Section 055000 – Metal Fabrications: Steel lintels.
   3. Section 061000 - Carpentry: Wood perimeter shims.
   4. Section 079000 - Joint Sealers: Perimeter sealants and back-up materials.
   5. Section 064000 – Architectural Woodwork: Interior wood trim.
   6. Section 088000 - Glazing: Other glass and glazing.

1.2 SYSTEM DESCRIPTION

A. (AW-1) Single, double hung and fixed aluminum replacement windows with profiles to match exiting historic windows.

B. General: In addition to requirements shown or specified comply with applicable provisions of AAMA/WDMA/CSA 101/I.S.2/A440-08 for design, materials, fabrication and installation of component parts.

C. Window Replacement Requirements:
   1. Work Included: Provide labor, materials and equipment necessary to complete the work of the Replacement Window Contract, and without limiting the generality thereof include:
   2. Removal of existing sash, fixed glazing, frames and other accessories as required by the proposed replacement system.
   3. Removal of other existing work as required for the proper installation and operation of the new units.
   4. Removal from site and legal disposal of all removed materials, debris, packaging, banding and all other surplus materials and equipment.
   5. Provide new factory glazed, thermally broken, aluminum windows, types as specified herein, together with necessary mullions, panning, trim, expanders, operating hardware, installation hardware and all other accessories as required.
   6. Insulated panels and frames as required in selected transoms and other locations.
   7. Treated wood blocking, fillers and nailers as required for secure installation. Bidders shall survey conditions of existing sills and jambs prior to bidding. Contractor shall be responsible for providing new blocking for portions of same that are deteriorated.
   8. Fiberglass insulation between window frames and adjacent construction.
   9. Sealing of all joints within each window assembly.
   10. Sealing of entire exterior perimeter of window units after installation.
   11. Field observations and measurements of existing openings and conditions.
   12. Furnishing and delivering of extra materials as specified.

D. Design Requirements:
   1. Manufacturer/subcontractor is responsible for designing system, including installation instructions and necessary modifications to meet specified requirements and maintain visual design concepts.
   2. Requirements shown by details are intended to establish basic dimension of unit, sight lines and profiles of members.
   3. Provide assemblies free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.

4. Installation instructions are to take into account specified site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.
5. Provide for expansion and contraction due to structural movement without detriment to appearance or performance.
6. Evacuate water without infiltration to interior from exterior face of wall, water entering joints, and condensation occurring within windows, by drain holes and gutters of adequate size or other acceptable method.
7. Provide concealed fastening wherever possible.

E. Performance Requirements: Requirements for aluminum windows, terminology and standards of performance, and fabrication and workmanship are those specified and recommended in AAMA/WDMA/CSA 101/I.S.2/A440-08 and applicable general recommendations published by AAMA. Conform to more stringent of specified AAMA standards and following:

1. Air Infiltration Test: Not exceed 0.25 cubic feet per minute per foot of crack length when tested at a pressure of 6.24 psf. Adjust sash to operate in either direction with a force not exceeding 45 pounds after the sash is in motion. Perform tests in accordance with ASTM E 283 with the sash in a closed and locked position.
2. Water Resistance Test: Subject window unit to a water resistance test in accordance with ASTM E 331 with no water passing the interior face of the window frame and no leakage as defined in the test method. Mount the glazed unit in its vertical position continuously supported around the perimeter and the sash placed in the fully closed and locked position. When a static pressure of 9.82 pounds per square foot has been stabilized, apply five gallons of water per square foot of window area to the exterior face of the unit for a period of 15 minutes.
3. Uniform Load Deflection Test: ASTM E 330 at 50 pounds per square foot: No member deflection more than 1/175 of its span. Maintain test load for a period of 10 seconds resulting in no glass breakage, permanent damage of fasteners, hardware parts, support arms, actuating mechanisms or any other damage causing the window to be inoperable.
4. Uniform Load Structural Test: Apply a minimum exterior and interior uniform load of 75.0 pounds per square foot to the entire outside surface of the test unit. Maintain this test load for a period of 10 seconds. Results: No glass breakage, permanent damage of fasteners, hardware parts, support arms, actuating mechanisms, or any other damage causing the window to be inoperable. And no permanent deformation of any frame or vent member in excess of 0.2 percent of its span.
5. Life Cycle Test: Per AAMA 101 and AAMA 910, provide proof that the product meets the criteria including passing air and water test at the conclusion of the cycle test.
6. Condensation Resistance Factor: Test in accordance with AAMA 1503 standards and tests of thermal performance resulting in a CRF of no less than 41 using Clear-Clear insulating glass.
7. "U" Value Tests: (Co-efficient of Heat Transfer): Thermal Transmittance of Conduction with a 15 mph perpendicular dynamic wind: 0.50 BTU/hr/ft2/F using one sheet low-E glass.
8. Product Certification: Per AAMA Certification Program, window manufacturer must submit certification that their base window system meets the AW criteria and is certified by AAMA.
9. Testing: Where manufacturer's standard window units comply with requirements and have been tested in accordance with specified AAMA/WDMA/CSA 101/I.S.2/A440-08 tests, provide certification by AAMA certified independent laboratory showing compliance with such tests. Submit copy of the test report signed by the independent laboratory

1.3 SUBMITTALS

A. Shop Drawings and Product Data: Submit by window manufacturer in accordance with Section 013300. Include wall opening and component dimensions; wall opening tolerances required; anchorage and fasteners; affected related work; installation requirements.

B. Samples: Submit window finish for color selection in accordance with Section 013300.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage experienced Installer who has completed installation of aluminum windows similar in material, design, and extent to those required for this project and with record of successful in-service performance.

B. Preinstallation Conference: Before beginning window installation, conduct preinstallation conference at Project site with window system manufacturer, installer, and other interested parties to review procedures, schedules, and coordination of window installation with other elements of Work.

C. Single-Source Responsibility: Obtain aluminum windows from one source and by single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver and handle window units to prevent damage to finished surfaces.

B. Store and protect window units in accordance with manufacturer's recommendations.

C. Provide wrapping to protect prefinished aluminum surfaces.

1.6 WARRANTY

A. Manufacturer's Warrantees: Submit written warrantees from window manufacturer for the following:
   1. Windows: Windows furnished are certified as fully warranted against any defects in material or workmanship under normal use and service for a period of two (2) year from date of fabrication.
   2. Finish: The pigmented organic finishes on exposed surfaces of windows and component parts (such as panning, trim, mullions and the like) are certified as complying fully with requirements of AAMA 2604 for pigmented organic coating and fully warranted against chipping, peeling, cracking or blistering for a period of ten (10) years from date of installation.
   3. Insulated Glass: Warranted from visual obstruction due to internal moisture for a period of ten (10) years.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design: Series 2200H Double Hung as manufactured by Graham Architectural Products, York, PA.

B. Comparable windows from EFCO or Traco.

A. Thermal Barrier: Provides a continuous uninterrupted thermal barrier around the entire perimeter of the frame and all sash and not be bridged by any metal conductors at any point. Provide manufacturer's standard construction which has been in use on similar window units for a period of not less than three years, has been tested to demonstrate resistance to thermal conductance and condensation and has been tested to show adequate strength per AAMA 505.

B. Glazing: Inside glazed window with an exterior sloped putty bead glazing return.

1. Putty bead profile - Not less than 45^{o} degree slope off the vertical plane of sash and shall extend inward a minimum of 0.312 inches.
2. Snap on sloped beads are not permitted.

C. Stating this product in no way prohibits other manufacturers from submitting alternate products of approved quality under the provisions of Division 1 Section “Substitutions.” Architect will record time required for evaluating substitutions proposed by Contractor after receipt of bids, and for making changes in the Contract Documents. Whether or not Architect accepts Contractor proposed substitution, Contractor shall reimburse Owner for charges of Architect and Architect’s consultants for evaluating each proposed substitution.

D. Document each request with supporting data substantiating compliance of proposed substitution with Contract Documents, including:
   1. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, sight lines and other pertinent characteristics.
   2. Net change to Contract Sum if substitution is accepted.
   3. Changes required in other Work.

4. AAMA Certified test data and reports to show compliance with performance characteristics specified.
5. Samples of product, finishes, and glazing when applicable.
6. Additional supporting information as necessary or requested.

E. A request for substitution constitutes a representation that Contractor:
1. Has investigated proposed product and determined that it is equal or superior in all respects to specified product.
2. Will provide identical warranty as required for specified product.
3. Will coordinate installation and make changes to other Work which may be required.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Certifies that proposed product will not affect or delay Construction Progress Schedule.
6. Will pay for changes to building design, including architectural or engineering design, detailing, and construction costs caused by the requested substitution.

F. Pre-Bid Qualifications:
1. All bids must be based on pre-qualified products. To qualify, the bidder must furnish one complete typical project size window unit 10 days prior to the time set for bids. Accompanying the sample will be certified test reports from an accredited AAMA Laboratory verifying that the performance of the product meets or exceeds the AW50 classification.
2. This sample must be a true and accurate representation of the window the bid is based on with the finish being the only exception. No verbal approvals will be given. Each submitter will be notified in writing of acceptance or rejection.
3. The manufacturer must verify that it has been engaged in the manufacturing of the product in their production facility for a period of five (5) years.
4. Maintenance manuals accompany the product sample being submitted for approval.
5. Sight lines to match the base product specified.
6. The qualified bidder must verify that the bidder has been involved with the installation of this type of product in a minimum of 5 projects of similar scope and quality.

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by window manufacturer for strength, corrosion resistance and application of required finish, but not less than 22,000 psi ultimate tensile strength, a yield of 16,000 psi. Comply with ASTM B 221.

B. Fasteners: Aluminum, stainless steel, or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors and other components of window units.
1. Do not use exposed fasteners on exterior except where unavoidable for application of hardware. Match finish of adjoining metal.
2. Provide non-magnetic stainless steel, tamper-proof screws for exposed fasteners, where required, or special tamper-proof fasteners.
3. Locate fasteners so as not to disturb the thermal barrier construction of windows.

C. Anchors, Clips And Window Accessories: Depending on strength and corrosion-inhibiting requirements, fabricate units of aluminum, non-magnetic stainless steel or hot-dip zinc coated steel or iron complying with ASTM A 123.

D. Compression Glazing Strips and Weatherstripping: At manufacturer's option, provide neoprene gaskets complying with ASTM D 2000 Designation 2BC415 to 3BC415, PVC gaskets complying with ASTM D2287, or expanded neoprene gaskets complying with ASTM C 509, Grade 4.

E. Sliding Weatherstripping: Provide double weatherstripping using silicone coated woven pile with a polypropylene center fin complying with AAMA 701.

F. Sealant:

1. Unless otherwise indicated for sealants required within fabricated window units, provide elastomeric type as recommended by window manufacturer for joint size and movement, to remain permanently elastic, non-shrinking and non-migrating. Provide product complying with AAMA Specification 803 and 808.
2. Refer to Division 7 for perimeter sealants between window units and surrounding construction.

G. Insect Screens: Half

1. Fabric: 18 x 16 fiberglass mesh retained in screen frames with vinyl splines that permit easy replacement.
2. Frames: Extruded aluminum sections or steel frames with corners mitered and crimped with corner gussets. Manufacturer's standard finish.

2.3 WINDOW TYPES (OPERATION)

A. General: Except as otherwise indicated, provide window units complying with requirements of AAMA Classification "AW" grade windows. Windows for this project will be rated a minimum of AW50 for full size test units per AAMA/WDMA/CSA 101/I.S.2/A440-08 to withstand a design pressure of 50 psf minimum.

B. Fixed Aluminum Windows or Panel Frames (F): No operating hardware or equipment is required.

C. Double Hung Aluminum Windows (DH):

1. Units: Two balanced, vertically sliding sash requiring up to four (4) counterbalancing mechanisms complying with AAMA 902 "Sash Balance Specifications". Lift rail will have nylon end caps to protect the machined ends of the rail. Saw cut or machined edges will not be acceptable. Pull down handle on bottom of meeting rail of upper sash if upper sash is operable.
2. Provide units which have "lift-out" feature permitting easy removal of both sash from inside without special tools.
3. Tilt-in type sash is not acceptable for this project

2.4 FABRICATION AND ACCESSORIES

A. General: Provide manufacturer's standard fabrication and accessories which comply with specifications. Include complete system for assembly of components and anchorage of window units and provide complete pre-glazing at the factory.

B. Window Material:

1. Windows and Muntin Bars: Aluminum.
2. Secondary Members (friction tabs, shoes, weatherstripping guides, etc.): Aluminum or a material compatible with aluminum.
3. Main Frame and Sash: Nominal thickness of not less than 0.062 inches, except for fin trim either integral or applied.
4. Frame Sill: Nominal thickness of not less than 0.094 inches.
5. Standard wall thickness tolerance: In accordance with the Aluminum Association.

C. Master Frame: Not less than 4 inches in depth.

D. Sash: Hollow extruded horizontal sections and not less than 1-9/16 inches in depth.

E. Hardware:

1. Material: Aluminum, stainless steel or other non-corrosive materials compatible with aluminum for hardware having component parts which are exposed. Cadmium or zinc-plated steel where used must be in accordance with ASTM Specification B 766 or B 633.
2. Aluminum automatic head and sill latches, one at head and two at sills over 26 inches, typical.
3. Limited Travel: Installation of an additional full length sash stop to limit the travel of either the top or bottom sash. Limit bottom sash travel to 6". Limit top sash travel 0".

F. Thermal Barrier: Provides a continuous uninterrupted thermal barrier around the entire perimeter of the frame and all sash and shall not be bridged by any metal conductors at any point.

G. Construction:
   1. Assembly: Fabricate butt joints of the main frame and the sash, coped and joined neatly and secured by means of screws anchored in integral ports. Seal main frame from the back with a narrow joint sealant meeting AAMA 803 specification for narrow joint sealants.
   2. Sash: Screwed together construction so that they may be easily repaired.
   3. Meeting rails of the top and bottom sash shall interlock in the closed position.
   4. Meeting Rail Interlock: Two separate and distinct metal interlocks. Weatherstrip the meeting rail with fin-seal.
   5. Fasten the top fixed meeting rail to the frame jamb by a minimum of two screws per jamb.

H. Mullions - Other structural members: When mullion units occur, whether they are joined by integral mullions, independent mullions or by a combination of frame members, the resulting members must be capable of withstanding the load outlined under Uniform Load specified load requirements, without deflecting more than 1/175th of its span. When independent or integral mullions are used to join windows, the mullions shall contain a thermal barrier as specified. Evidence of compliance may be by mathematical calculations.

I. Balances: Size and capacity required to hold both top and bottom sash stationary in any open position. Easily accessible and replaceable in the field without the use of special tools. Spiral balances will not be accepted.
   1. High Performance Balances: Meet or exceed Class V performance with a MAF ratio of 0.30 Maximum sash weight not to exceed 120 pounds. High performance balances typically operate with 30 pounds of operating force or less. Allowable is 45 pounds. Furnish Class V (Ultra-Lift) balances when sash weight exceeds 65 pounds or windows are typically large for the project.

J. Sash:
   1. Join at the corners with screws in integral screw ports.
   2. The sash must be easily removed from the frame for either cleaning or repair.

K. Glazing:
   1. Pre-glaze all units at the factory with insulated glass as follows:
      a. Typical Insulated Glass: Overall thickness 1 inch with two lites of 3/16 inch as size and loading require.
         1) Primary Sealant: Polyisobutylene applied to the edge of the spacer.
         2) Secondary Sealant: Silicone.
         3) Air Spacer: Continuous metal spacer with formed corners and an in-line connector, containing desiccant.
   2. Glaze units to allow for glass replacement without the use of special tools.
   3. Cardinal 270 LoE on surface #2.
   4. Airspace filled with argon gas.

L. Weather Protection:
   1. Provide means of drainage for water and condensation which may accumulate in members of window units.
   2. Weatherstripping: Provide sliding weatherstripping for operating sash.

M. Screens: Provide screens on operating vents as indicated on the architectural plans. Screen mesh: Fiberglass, Color: Black

N. Simulated True Muntin: The simulated muntin is a triple muntin system to simulate a true muntin appearance. Align muntins within the windows system and from window to window within an industry acceptable tolerance.
   1. Exterior Grids: Hollow extruded aluminum, finish to match the window system, or as shown on plans. Attach grids without exposed fasteners.
   2. Interior Grid: 0.750” x 0.062” aluminum profile grid as applicable, finish to match window system.
   3. Muntin In-between Glass: Aluminum muntin in glass simulates glass perimeter spacer between interior and exterior applied grid. Machine and mechanically fasten the intersections of muntin grids. Fasten the grid to the sloped perimeter vent at each contact point.

2.5 CASING COVER SYSTEM: (PANNING, TRIMS, RECEPTORS, MULLIONS, SILLS ETC.)

A. Exterior Casing Covers (Panning, Sills): Provide extruded prime alloy aluminum 6063-T5 no less than nominal 0.078 inch wall thickness. Casing covers of less than 2 inches in depth from the window frame may be of 0.062 inch wall thickness. Provide aluminum sections of one piece designed to lock around the entire window frame for a weathertight connection.
   1. Secure the casing cover section at the corners with stainless steel screws in integral screw ports with the joints back sealed using a compatible sealant.
   2. Exposed screws, fasteners or pop rivets are not acceptable on the exterior of the casing cover system.

B. Exterior mullion covers: Extruded aluminum shape to provide rigidity, no less than nominal 0.062 inch wall thickness. Seal against the casing cover sections with continuous bulbous vinyl weatherstrip interlocked within the mullion cover.

C. Interior trim:
   1. Interior Trim, Closures and Angles: As detailed, of extruded shapes no less than 0.062 inch nominal wall thickness.
   2. Snap Trim: Apply in full length without splices and attach with clips spaced no more than 18 inches on center. Clips shall be no less than 3 inches long. No exposed screws will be allowed on interior trim.

2.6 FINISHES

A. Provide manufacturer's standard 2 coat 50% Fluoropolymer or Silicone Polyester, baked on, electrostatically applied enamel coating. Color to be selected from manufacturer's standard colors as selected by the Architect, applied over manufacturer's standard substrate preparation including cleaning, degreasing, and chromate conversion coating. Finish shall meet or exceed AAMA 2604.
   1. Color:
   2. Manufacturer's Code:

B. Concealed Steel Items: Galvanized in accordance with ANSI/ASTM A386 to 2.0 oz/sq. ft. (Primed with iron oxide paint.)

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

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine openings , substrates, structural supports, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, moisture barrier, and other built-in components; operational clearances; and other conditions affecting performance of work.
   1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
   2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
   3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

3.2 PREPARATION

A. Existing Construction:
   1. Do not remove existing windows until new replacements are available and ready for immediate installation. Do not leave any openings uncovered at end of working day, during wind-driven precipitation or during excessively cold weather.
   2. Remove existing work carefully, avoid damage to existing work to remain.

B. Perform operations as necessary to prepare openings for proper installation and operation of new retrofit units or new construction units.

C. Verify openings are in accordance with shop drawings and Architects Drawings.

3.3 INSTALLATION

A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators and other components of work. In no case shall attachment to structure or to components of the window system be through or affect the thermal barriers of the window units.

B. Set units plumb, level and true to line, without warp or rack of frames or sash. Anchor securely in place. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action.

C. Wedge fiberglass insulation between frames of new windows and construction to remain, or between frames and new receptor as applicable. Compress fiberglass to no less than 50 percent of original thickness.

D. Set sill members and other members in bed of compound as shown, or with joint fillers or gaskets as shown, to provide weathertight construction. Seal units following installation and as required to provide weathertight system.

3.4 ADJUST AND CLEAN

A. Adjust operating sash and hardware to provide tight fit at contact points and at weatherstripping, for smooth operation and weathertight closure.

B. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and moving parts.

C. Clean glass promptly after installation of windows. Remove glazing and sealant compound, dirt and other substances.

D. Existing windows and other materials removed from site become property of the Contractor who shall promptly remove same and legally dispose of at no additional cost to the Owner.

E. Comply with all applicable laws, rules and regulations.

3.5 PROTECTION

A. Initiate all protection and other precautions required to ensure that window units will be without damage or deterioration (other than normal weathering) at time of acceptance.

B. Send to Architect, with copy to Owner, written recommendations for maintenance and protection of windows following Substantial Completion of Window Contract.

END OF SECTION

SECTION 085200
WOOD WINDOWS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood window units, single hung, fixed frame, fixed sash; flat, and arched tops.
      a. All window units to match existing historic profiles including, frame moldings, brick trim, pediments, sash and muntins.
   2. Glass and glazing and weatherstripping.
   3. Steel reinforcement, anchorages, attachments and hardware.

B. Related Sections:
   1. Section 013591 - Historic Treatment Procedures.
   2. Section 061000 - Rough Carpentry: Wood framing and blocking.
   3. Section 079000 - Joint sealers.
   4. Section 064000 - Architectural Woodwork: Interior wood trim.
   5. Section 099000 - Painting
   6. Section 081400 - Wood Doors: Other wood doors.
   7. Section 088000 - Glazing: Other glass and glazing.

1.2 SUBMITTALS

A. Wood Samples: Duplicate pairs of samples for each species of unfinished wood proposed for production work.
   1. Samples shall be large enough to accurately show typical appearance characteristics.
   2. Each pair of samples shall show extremes of appearance characteristics range proposed for work. Wood used for production shall be within approved range.

B. Shop Drawings:
   1. Schedule: Window and door types, sizes, locations, and quantities, keyed to scale elevations.
   2. Details: Full or large scale, keyed to scale elevations. Show frame and sash construction, glazing, weep/vent provisions, hardware, weatherstripping, anchorage. Identify materials/species and finishes.
   3. Installation: Clearly show relation to adjoining construction. Give blocking requirements, clearances, and instructions necessary for proper installation.

C. Certifications:
   1. Fabricator Qualifications: List Projects having windows of kind required for project. Installations shall have at least two-year successful service history. Work shall have been done to meet job conditions and performance requirements of kind shown and specified for this project. Give installation dates, locations, Owners' names and addresses of each project.
   2. Test Reports: Certified testing agency reports to show compliance with specified window performance requirements. Test shall have been made within 5 years of submission. They shall include test descriptions and results, and complete enough product descriptions to show that tested products are representative of those proposed for project.
   3. Preservative Treatment: Fabricator's certificate identifying wood preservative treatment and moisture content immediately before treatment.

D. Maintenance Instructions: 2 copies of window manufacturer's information manual with recommendations for routine Owner maintenance of window units, hardware and wood finishes; and instructions for removing and replacing sash.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Fabricator: Regularly engaged for at least 5 years fabricating products of kind and quality required for Project.

2. Installer: Experienced installer who has completed comparable work, and is acceptable to manufacturer.

B. Design Criteria:
   1. Walls, Wall Openings: Accommodate allowable building wall construction tolerances and moisture-caused swell without stressing or deforming window and door units or over stressing anchorage.
   2. Moisture Changes: Accommodate wood shrinking and swelling caused by ambient conditions at Project, without stressing window and door units, overstressing anchorage, causing sash to bind, exceeding air/water entry limits.
   3. Window Performance: Comply with NWMA I.S.2 Class A window requirements for air infiltration, water penetration, and physical load, at static air pressure 50 mph for 15 minutes with no water penetration.
   4. Glazing Provisions: As recommended by glass manufacturer.

C. Manufacturer Inspection: Arrange and pay costs for periodic project visits by qualified representative of window fabricator. Representative shall visit Project at start of window installation at least once thereafter. The representative shall instruct installer in proper procedures and determine, with reasonable assurance, that installation is done in accordance with fabricators requirements.

D. Reference Standards:
   1. AW1 - Architectural Woodwork Quality Standards, 2007 Edition, of Architectural Woodwork Institute.
   2. FS FF-H-111C - Hardware, Builders; Shelf and Miscellaneous.
   3. FS QQ-Z-325B(1) - Zinc Coating, electro-deposited, Requirement for.
   4. FS TT-W-527B(1) - Wood Preservative; Water Repellent.
   5. NWMA I.S.2 - Industry Standards for Wood Window Units.
   6. NWMA I.S.4 - Industry Standards for Water-Repellent Preservative Non-Pressure Treatment for Millwork.

E. Allowable Tolerance:
   1. Glazed Openings: Diagonal dimension of glazed openings shall not differ by more than 1/8 inch. Glazing channels shall not bow more than 1/16 inch per 4 feet, not exceed 1/32 inch corner offset.
   2. Erection Tolerances: Not more than 1/8 inch per 12 linear feet variation from plane of location shown in reviewed shop drawings.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver factory assembled units, suitable protected. Bundle loosed materials as necessary to prevent loss and damage.

B. Store products in clean, protected, dry well ventilated building, on platforms or blocking at least 4 inches above floor. Stack products so they do not warp, bend or twist. Store windows and doors upright, not flat, with at least 1/4 inch air space between units.

C. Handle windows and doors with clean hands or canvas gloves.

1.5 PROJECT CONDITIONS

A. Connecting Work: Constructed to specified tolerances. Field dimensions agreed upon, prior to fabrication.

B. Reference Points: Bench marks and other required references points shall be established.

C. Environmental Conditions: Air temperature during installations shall be at least 40 degrees F and rising, and wind light or still. Work areas and materials shall be dry and free of ice and snow.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and Type: Pella Corporation, 102 Main Street, Pella, Iowa 50219. Toll Free (800) 54-PELLA. Phone (641) 621-1000. Website www.pella.com.

2.2 WOOD DOUBLE-HUNG WINDOWS

A. (WD WDW-1) Factory-Primed Wood Double-Hung and Fixed Windows: Architect Series factory-assembled wood double-hung windows. Sash shall tilt to interior without removal for cleaning.

B. Frame:
   1. Select wood, water-repellent, preservative-treated with EnduraGuard® in accordance with WDMA I.S.-4. EnduraGuard includes water-repellency, three active fungicides and an insecticide applied to the frame.
   2. Exposed Surfaces: Factory-primed pine with no visible fastener holes.
   3. Exterior Finish: Factory-Primed.
   4. Overall Frame Depth: 4-3/8 inches (111 mm).

C. Sash:
   1. Select wood, water-repellent, preservative-treated with EnduraGuard in accordance with WDMA I.S.-4. EnduraGuard includes water-repellency, three active fungicides and an insecticide applied to the sash.
   2. Exposed Surfaces: Factory-primed pine with no visible fastener holes.
   3. Exterior Finish: Factory-Primed.
   4. Corners: Mortised and tenoned, glued and secured with metal fasteners.
   5. Operable sash tilt to interior for cleaning or removal.
   6. Sash Thickness: 1-3/4 inches (44 mm).

D. Weather Stripping:
   1. Water-stop santoprene wrapped foam at head and sill.
   2. Thermal-plastic elastomer bulb with slip coating set into lower sash for tight contact at checkrail.
   3. Vinyl-wrapped foam inserted into jambliner or jambliner components to seal to sides of sash.

2.3 GLAZING

A. Glazing:
   1. Float Glass: ASTM C 1036, Quality 1.
      a. Tempered Glass: ASTM C 1048 where required by code.
   2. Type: Silicone-glazed 5/8-inch dual-seal, annealed, insulating glass, clear multi-layer Low-E coated with argon.
   3. Integral Light Technology Glazing and Grilles:
      a. Insulating glass contains foam grille grid between 2 panes of glass.
      b. Foam Grid: Adhered to glass.
      c. Room Side Grilles: Solid 7/8-inch wide clear pine.
      d. Exterior Grilles: Pine water repellent, preservative-treated. Dimension to match room side grilles.
      e. Bars shall be adhered to both sides of insulating glass with VHB acrylic adhesive tape and aligned with foam grid.
      f. Finish: Exterior surfaces are pine water-repellent, preservative-treated; interior surfaces factory-primed

B. Insect Screens: Standard half height on operable windows.
   1. Compliance: ASTM D 3656 and SMA 1201.
   2. Screen Cloth: Vinyl-coated fiberglass, 18/16 mesh.
   3. Set in aluminum frame fitted to inside of window.
   4. Complete with necessary hardware.
   5. Screen Frame Finish: Baked enamel.
      a. Color: Finish to match exterior window cladding, color as selected by the Architect.

2.4 HARDWARE

A. Balances:
   1. Block-and-tackle balances.
   2. Balances are attached to frame and connected to sash with polyester cord.

B. Locking System:
   1. Self-aligning sash lock factory-installed.
   2. One installed on units with frame width less than 37 inches, 2 locks installed on units with frame width of 37 inches or greater.

C. Sash Lifts:
   1. Sash lift furnished for field installation.
   2. One sash lift on units with frame width less than 37 inches, 2 sash lifts on units with frame width of 37 inches or greater.

D. Lock and Sash Lift Finish: [Baked enamel, champagne] [Baked enamel, white] [Baked enamel, brown] [Bright brass] [Oil-rubbed bronze] [Satin nickel].

E. Limited Opening Device: Factory applied in stainless steel device concealed from view. Nominal 3-3/4" opening.

2.5 TOLERANCES

A. Windows shall accommodate the following opening tolerances:
   1. Vertical Dimensions between High and Low Points: Plus 1/4 inch, minus 0 inch.
   2. Width Dimensions: Plus 1/4 inch, minus 0 inch.
   3. Building Columns or Masonry Openings: Plus or minus 1/4 inch from plumb.

2.6 FINISH

A. Interior Finish: Factory-primed with 1 coat acrylic latex.

2.7 INSTALLATION ACCESSORIES

A. Flashing/Sealant Tape: Pella SmartFlash.
   1. Aluminum-foil-backed butyl window and door flashing tape.
   2. Maximum Total Thickness: 0.013 inch.
   3. UV resistant.
   4. Verify sealant compatibility with sealant manufacturer.

B. Interior Insulating-Foam Sealant: Low-expansion, low-pressure polyurethane insulating window and door foam sealant.

C. Exterior Perimeter Sealant: “Pella Window and Door Installation Sealant” or equivalent high quality, multi-purpose sealant as specified in the joints sealant section.

2.8 SOURCE QUALITY CONTROL

A. Factory Testing: Factory test individual standard operable windows for air infiltration in accordance with ASTM E 283, to ensure compliance with this specification.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive windows. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install windows in accordance with manufacturer's instructions and approved shop drawings.

B. Install windows to be weather-tight and freely operating.

C. Maintain alignment with adjacent work.

D. Secure assembly to framed openings, plumb and square, without distortion.

E. Integrate window system installation with exterior weather-resistant barrier using flashing/sealant tape. Apply and integrate flashing/sealant tape with weather-resistant barrier using watershed principles in accordance with window manufacturer's instructions.

F. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating-foam sealant.

G. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly.

H. Leave windows closed and locked.

3.3 FIELD QUALITY CONTRO

A. Field Testing: Field-test windows in accordance with AAMA 502, Test Method A. Manufacturer’s representative shall be present

3.4 CLEANING

A. Clean window frames and glass in accordance with Division 01 requirements.

B. Do not use harsh cleaning materials or methods that would damage finish.

C. Remove labels and visible markings.

3.5 PROTECTION

A. Protect installed windows to ensure that, except for normal weathering, windows will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 086200
UNIT SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

A. Fixed curb mount unit skylight with formed curb counterflashing for mounting on prefabricated roof curbs, for flat, low-slope and steep-slope roofing applications.

1.2 RELATED REQUIREMENTS

A. Section 061000 " Rough Carpentry" for site-built wood roof curbs for unit skylights.

B. Division 07 roofing section for flashing and roofing terminations at unit skylight curbs.

1.3 REFERENCE STANDARDS

A. General: Applicable edition of references cited in this Section is current edition published on date of issue of Project specifications, unless otherwise required by building code in force.

B. American Architectural Manufacturers Association (www.aama.net), Window & Door Manufacturers Association (www.wdma.com), Canadian Standards Association (www.csagroup.org/us/en/services)

1. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/ Specification for Windows, Doors, and Skylights (NAFS)
2. CSA A440S1-09 – Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440
3. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems
4. AAMA 2603 – Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum and Panels

C. ASTM International: www.astm.org:

1. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
2. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings
3. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
4. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
5. ASTM E 408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
6. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials

D. Code of Federal Regulations:

1. 29 CFR 1910.23 (e) (8) - Occupational Safety and Health Standards for Walking-Working Surfaces to Guard Floor and Wall Openings and Holes

E. National Fenestration Rating Council: www.nfrccommunity.org:

1. NFRC 100 - Procedure for Determining Fenestration Product U-factors
2. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

1.4 COORDINATION

A. Coordinate dimensions, locations, and details of skylight curbs [specified in Section 06100 "Rough Carpentry"" with unit skylight curb flashings. Verify requirements for roofing system terminations.

B. Coordinate unit skylight interior termination locations with structural layout, ceiling grid layouts, and other ceiling-mounted items.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site prior to delivery of unit skylight and installation of roof deck.

1.6 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 013300.

B. Clearly indicate construction, configurations, jointing methods and locations when applicable, fastening methods and installation details.

C. Shop Drawings: For unit skylight work. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.

D. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer listed in this Section with minimum 20 years' experience in the US manufacturing similar products in successful use on similar projects and able to provide unit skylights meeting requirements.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship under normal use within specified warranty period.
   1. Failures include, but are not limited to, the following:
   2. Deterioration of metals, metal finishes, dome, and other materials beyond normal weathering.
   3. Breakage of glazing.
   4. Warranty Period:
   5. Unit Skylight and Flashing Product Warranty: 10 years from date of purchase.
   6. Unit Skylight and Flashing Installation “No Leak” Warranty: 10 years from date of purchase.
   7. Hail Breakage Warranty for Skylight Glass: 10 years from the date of purchase on all insulated glass units using laminated glass.
   8. Insulating Glass Seal Failure Warranty: 20 years from date of purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products of VELUX America Inc., Greenwood, SC 29648; www.VELUXusa.com; (800) 878-3589, specifications@veluxusa.com.

B. Substitutions: As permitted under Instructions to Bidders and Section 016210 - Product Options and Substitution Requirements.

C. Source Limitations: Obtain unit skylights through single source from single manufacturer.

2.2 FIXED CURB MOUNTED (FCM) UNIT SKYLIGHTS

A. System Description: Fixed curb mounted unit skylight with a roll-formed aluminum frame counter-flashing joined by corner keys, an interior condensation drainage gasket, an insulated glass unit, structural sealant, mounting fasteners, flashing and accessories, as required to meet installation and performance requirements indicated. FCM skylights shall be suitable for installation on roof curbs ranging from 0 degrees up to 60 degrees from horizontal.
   1. Basis of Design (SKLTM-1): VELUX America, Inc, Model FCM Fixed Curb Mount Skylight.
      a. Size: Custom sizes as indicated on the drawings.

B. Aluminum Frame Counter-flashing: Maintenance-free, roll-formed aluminum, 15 gauge, 0.06 inch (1.5 mm) thick with neutral grey Kynar® 500 polyvinylidene fluoride resin finish. Counter-flashing frames joined with neutral grey corner keys constructed from injection molded Acrylonitrile Styrene Acrylate (ASA)-Luran.
   1. Unit Sizes: Special order as indicated on Drawings.

C. Condensation Drainage Gasket: Factory applied black thermoplastic rubber gasket mounted around the entire interior aluminum frame assembly providing a thermal break weather seal and drainage for interior condensation.

D. Insulated Glass Unit: Factory assembled with low emissivity exterior pane and clear interior pane separated by a stainless steel spacer sealing the space between panes with 95% argon gas.
   1. Exterior Pane: 0.125 inch (3mmthick tempered glass with interior surface coated with three layers of low emissivity silver (LoE3) coatings.
   2. Interior Pane:
      a. Laminated, Two clear 0.090 inch (2.3 mm) heat-strengthened panes with a 0.030 inch (0.76 mm) clear polyvinyl butyral interlayer sandwiched together.

E. Structural Sealant: Factory applied silicone sealant, black color, bonding the glass pane to the aluminum frame and suitable for external exposure.

F. Mounting Fasteners: #8 x 1.75 inch (44 mm) stainless steel, black zinc coated, self-drilling screws provided with skylight. fFeld installed screws secures skylight to site built curb as indicated in manufacturer's installation instructions.

2.3 FLASHINGS

A. Step Flashing: Roll formed aluminum, neutral grey finish, factory engineered and fabricated seams, consisting of head flashing, sill flashing, step flashing pieces and adhesive underlayment suitable for use with 6 inch (150 mm) curbs on roof pitches 10 to 60 degrees from horizontal.
   1. Basis of Design: VELUX America, Inc, ECL Step Flashing.
   2. Size: As required for skylight sizes indicated.
   3. Material:
      a. Head flashing 23 gauge (0.57 mm) thick aluminum with polyester lacquer finish.
      b. Sill flashing 22 gauge (0.65 mm) thick aluminum with Kynar 500 finish.
      c. Step pieces 23 gauge (0.57 mm) thick aluminum with polyester lacquer finish.
      d. Adhesive underlayment: 9 inches (229 mm) wide x 21 feet (6.4 m) length x 0.03 inch (0.8 mm) thick, SBS modified bitumen with white polyethylene backing sheet.

B. High Profile Flashing: Roll formed aluminum, neutral grey finish, factory engineered and fabricated seams, consisting of head flashing, sill flashing, side gutter pieces, counter flashing and adhesive underlayment suitable for use with 4 inch (100 mm) and 6 inch (150 mm) curbs on roof pitches 14 to 60 degrees from horizontal.
   1. Basis of Design: VELUX America, Inc, ECW High Profile Flashing.
   2. Size: As required for skylight sizes indicated.
   3. Material:
      a. Head flashing 23 gauge (0.57 mm) thick aluminum with polyester lacquer finish.
      b. Sill flashing 22 gauge (0.65 mm) thick aluminum with Kynar 500 finish and 9 inch (229 mm) pleated apron.
      c. Side gutter pieces 23 gauge (0.57 mm) thick aluminum with polyester lacquer finish.

d. Counter-flashing 23 gauge (0.57 mm) thick with 4 inch (100 mm) curb counter flashing, aluminum with polyester lacquer finish.
e. Adhesive underlayment: 12 inches (305 mm) width x 21 feet (6.4 m) length x 0.03 inch (0.8 mm) thickness, SBS modified bitumen with white polyethylene backing sheet.

2.4 PERFORMANCE REQUIREMENTS

A. Unit Skylight Standard, FCM 4646 or smaller unit with tempered Lo-E 366 coated exterior glass pane and interior pane as follows:

B. AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS-11 or previous):
1. Performance Class and Grade (Primary Designator)
[Laminated with 0.030 inch (0.76 mm) Interlayer: “Class CW-PG90 Size Tested 1308 x 1308 mm (51 x 51 in.)-SKG”.
[Tempered: “Class CW-PG100 Size Tested 1308 x 1308 mm (51 x 51 in.)-SKG”.
2. Design Pressure (DP):
Laminated with 0.030 inch (0.76 mm) Interlayer: DP = +175/-90 psf (+8.38/-4.3 kPa)
a. Tempered: DP = +100/-105 psf (+4.9/-5.03 kPa)
3. Water Test Pressure: 15 psf (0.72 kPa) with no leakage at 5 gallons per minute spray rate.
4. Canadian Air Infiltration/Exfiltration Rating: Fixed. (0.2 L/s/m2 maximum)

C. Fire Ratings for Roof Assemblies with Fire Classifications: Unit skylight tested in accordance with ASTM E 108 and listed as passing Burning Brand test with target classification of Class B.

D. Energy Performance ratings for any size fixed curb mounted unit skylight with tempered Lo-E 366 coated exterior glass pane and interior pane as follows:
1. Thermal Transmittance: NFRC 100 maximum U-factor:
a. Clear Laminated with 0.030 inch (0.76 mm) Interlayer: 0.48 Btu/hr*ft2*deg F (2.73 W/m2*deg C).
b. Tempered: 0.49 Btu/hr*ft2*deg F (2.78 W/m2*deg C).
2. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum SHGC:
a. Clear Laminated with 0.030 inch (0.76 mm) Interlayer: 0.27
b. Tempered: 0.27
3. Visible Transmittance (Vt): NFRC 200 maximum Vt:
a. Clear Laminated with 0.030 inch (0.76 mm) Interlayer: 0.63
b. Tempered: 0.64
4. Fall Protection Standard Compliance: 29 CFR 1910.23: Passed for all laminated fixed curb mount unit skylights.

2.5 MATERIALS

A. Aluminum Sheet: Flat sheet complying with ASTM B 209/B 209M.

B. Joint Sealants: As specified in Section 079200 "Joint Sealants."

C. Mastic Sealants: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION

A. Install unit skylights in accordance with manufacturer's written instructions and approved shop drawings. Coordinate installation of units with installation of substrates, air and vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that finished installation is weather tight.

1. Anchor unit skylights securely to supporting substrates.
2. Install unit skylights on curbs specified in another section with tops of curbs parallel to finished roof slope.

B. Where metal surfaces of unit skylights will contact incompatible metal or corrosive substrates, including preservative-treated wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.

C. For custom flashings, install unit skylight curb counter-flashing to produce weatherproof seal with curb and overlap with roofing system termination at top of curb.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage testing agency to perform tests and inspections.

1. Test for water leaks according to AAMA 501.2 after installation and curing of sealants but prior to installation of interior finishes.
2. Perform test for total area of each unit skylight.

B. Work will be considered defective if it does not pass tests and inspections.

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

D. Prepare test and inspection reports.

3.4 CLEANING AND PROTECTION

A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Replace glazing that has been damaged during construction period.

C. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.

END OF SECTION

SECTION 088000
GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Monolithic vision glass.
      a. Laminated glass.
   2. Insulated vision glass.
   3. Fire-rated glazing
   4. Accessories, glazing and setting materials.

B. Related Sections:
   1. Section 079000 – Joint Protection.
   2. Section 084113 – Aluminum Entrances and Storefronts: Glass stops and glazing gaskets.
   3. Section 085113 - Aluminum Windows: Glass in aluminum window system.
   4. Section 102813 – Toilet Accessories: Metal-framed mirror units.
   5. Section 084114 – Aluminum Interior Doors and Frames: Glass stops and glazing gaskets.

1.2 DEFINITIONS

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

B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

C. Deterioration of Coated Glass: Defects developed from normal use attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

D. Deterioration of Laminated Glass: Defects developed from normal use attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

E. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
   1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
      a. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.

b. Specified Design Snow Loads: As indicated, but not less than snow loads applicable to Project, required by ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 7, "Snow Loads."
c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
    1) Load Duration: 60 seconds or less.
d. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
    1) For monolithic-glass lites heat treated to resist wind loads.
    2) For insulating glass.
    3) For laminated-glass lites.
e. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
f. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
    1. Temperature Change (Range): 120 deg F , ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
    1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
    2. For laminated-glass lites, properties are based on products of construction indicated.
    3. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch- wide interspace.
    4. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F .
    5. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
    6. Solar Optical Properties: NFRC 300

1.4 APPLICABLE STANDARDS

A. Safety Glazing: Conform to Safety Standard for Architectural Glazing Materials (16 CFR 1201). Tempered glass and wire glass shall conform to requirements of ANSI Z97.1, with permanent label in accordance with statutes.

B. Insulating Glass: ASTM E773, Seal Durability of Sealed Insulating Glass Units and ASTM E774, Sealed Insulating Glass Units. Certification through Insulating Glass Certification Council, Class A level.

C. Flat Glass: ASTM C1036, Flat Glass. Flat Glass Marketing Association (FGMA) Glazing Manual.

D. Laminated Glass: ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass; Comply with applicable quality requirements for cut sizes of flat laminated glass consisting of two or more lites of glass bonded with interlayer material for use in building glazing.

1.5 SUBMITTALS

A. Product Data: Provide for structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

B. Shop Drawings:
    1. Review window and door shop drawings and submit acceptance of details as suitable for proposed glass products.

C. Calculations: Structural design shall be performed by a Professional Engineer, licensed in the state where Project is located, per IBC Section 2403, for glass not supported on 4 sides, including glass supports and framing, indicating structural integrity of glass size, glass support members, anchors, fasteners and connections to building, in accordance with specified criteria. Signed engineering calculations shall be submitted to Architect/Engineer.

1. Engineering Responsibility: Calculations shall be reviewed for stated design assumptions, general compliance to specified requirements, and forces imposed on glass structure. The accuracy of the design calculations shall be the sole responsibility of the Contractor's Professional Engineer.

D. Samples: Submit samples of sandblasted/frosted, spandrel, decorative and wire glass, and glazing sealant, for color selection and appearance acceptance.

E. Insulating Glass Certification: Submit data verifying compliance with IGCC, Class A level.

F. Compatibility Certification: After testing and review, certify compatibility of materials in contact and in close proximity to glazing sealant materials.

G. Wind Pressure and Thermal Stress Analysis: Submit thermal stress analysis of glass where thermal stress may occur.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

B. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

C. Single Source Responsibility: Provide materials obtained from one source for each type of insulating glass and glazing product indicated.

D. Fire-Rated Door Assemblies: 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, based on testing according to NFPA 252

E. Fire-Rated Window Assemblies: 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, based on testing according to NFPA 257.

F. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

G. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following inspecting and testing agency:

1. Insulating Glass Certification Council.

H. Mockups: Before glazing, build mockups for each glass product indicated below to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in the combination with curtain wall mockup requirements.

2. Build mockups with the glass to match glazing systems required for Project, including typical lite size, framing systems, and glazing methods:
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Obtain Architect's approval of mockups before starting fabrication.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed.

1.7 PRODUCT HANDLING

A. Deliver and store glass and glazing in manufacturer's protective covering. Handle glass and glazing with care to prevent damage.

1.8 PROJECT/SITE CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 GLASS WARRANTY

A. Warranty for Insulating Units: Warranty sealed insulating glass units for minimum period of ten (10) years, with manufacturer's replacement guarantee, covering as minimum: Defective or failure of seal; material vision obstruction as result of dust collection or film formation between panels or other similar failure and the following specific conditions:
   1. Reflective glass whose reflective coating cracks, peels or discolors shall be replaced at no charge (material only) for minimum ten (10) year period beginning on date of Substantial Completion.
   2. In addition to replacement of insulated units, provide removal and reinstallation of new units without cost to Owner during first five (5) years of guarantee.

B. Spandrel Glass Warranty: Spandrel glass whose opacifier delaminates, cracks, peels, wrinkles, discolors, or stains shall be replaced at no charge (material only) for minimum five (5) year period beginning on date of Substantial Completion.

C. Laminated Glass Warranty: Laminated glass that delaminates shall be replaced at no charge (material only) for minimum 5 years beginning on date of Substantial Completion.

D. Glazing installer shall coordinate glass and glazing installation with framing systems, and install glass and glazing in accordance with manufacturer's instructions, so that guarantee is maintained.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers for Glass Substrate:
   1. AFG Industries.
   2. ACH Float Glass Operations (Versalux)
   3. Guardian Industries.
   4. Pilkington.
   5. PPG Industries Glass Group.

B. Acceptable Fabricators for Insulated Glass Units:
   1. Any manufacturer/fabricator with "CBA" classification.

C. Acceptable Fabricators for Metallic Coated Units:
   1. Viracon Incorporated.
   2. Tempglass Eastern.
   3. PPG Industries Glass Group.

2.2 SINGLE GLASS

A. (GL-1) Clear Float Glass: 1/4 inch thickness; comply with ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).

1. (GL-1T) Clear Tempered Glass: 1/4 inch thickness; comply with ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), and further processed to comply with ASTM C1048, Kind FT (fully tempered).

2.3 LAMINATED MONOLITHIC GLASS

A. (GL-15) Laminated Clear Glass: 3/4 inch thick laminated glass, 2 layers of 3/8 inch clear glass laminated with 0.060 inch clear PVB inner layer. Edges ground smooth for exposed conditions.

2.4 INSULATING GLASS

A. (GL-21) Clear Low-E Insulated Glass Unit: One inch thick unit constructed of 1/4 inch clear exterior light, 1/2 inch air space using fabricators warm edge spacer, and 1/4 inch clear interior. High performance low-emissivity coating on No. 2 surface and argon gas in cavities. Glass thickness and thickness of individual glass plies are minimum. One or both plies heat strengthened where required for wind pressure or thermal stress.

1. Visible transmittance: 70 percent.
2. Shading coefficient: 0.43
3. Nighttime Winter U-value: 0.25 BTU/hour/square foot maximum.
4. Acceptable products:
   a. Viracon: Solarscreen 2000, VE 1-2M.
   b. Comparable product of other specified manufacturers.

B. (GL-21T) Clear Tempered, Low-E Insulated Glass Unit: One inch thick unit constructed of 1/4 inch clear tempered exterior light, 1/2 inch air space using fabricators warm edge spacer, and 1/4 inch clear tempered interior light. Low-emissivity coating on No. 2 surface and argon gas in cavity. Glass thickness and thickness of individual glass plies are minimum.

1. Acceptable products:
   a. Viracon: Solarscreen 2000, VE 1-2M.
   b. Comparable product of other specified manufacturers.

2.5 INSULATED LAMINATED GLASS

A. (GL-31) Insulated Glass Units: 1-1/16 inch thick laminated, insulated, low-e coated glass unit, 1/4 inch clear heat strengthened outboard light (unless tempered is required for wind pressure or thermal stress), 1/2 inch air space using fabricators warm edge spacer, 2 layers of 1/8 inch clear heat strengthened inboard light laminated with 0.060 inch clear PVB inner layer.

1. Visible transmittance: 39 percent.
2. Outside reflectance: 11 percent maximum.
3. Nighttime winter U-value: 0.29 BTU/hour/square foot maximum.
4. Shading coefficient:
5. Relative heat gain: BTU/hour/square foot maximum.
6. Silkscreen Pattern:
7. Product:
   a. Viracon: Solarscreen
   b. Comparable product of other specified manufacturers.

2.6 FIRE-RATED GLAZING

A. (GL-61) Monolithic Ceramic Glazing: Proprietary product in the form of clear flat sheets of 3/16-inch (5-mm) nominal thickness weighing 2.5 lb/sq. ft. (12.2 kg/sq. m), and as follows:

1. Fire-Protection Rating: As indicated for the fire window in which the glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
2. Textured on one surface, translucent.
3. Polished on both surfaces, transparent.

4. Unpolished on both surfaces, transparent.
5. Product: Subject to compliance with requirements, provide the following product manufactured by Nippon Electric Glass Co., Ltd. and distributed by Technical Glass Products:
   a. "Obscure FireLite" (textured).
   b. "Premium FireLite" (polished on both surfaces).
   c. "Standard FireLite" (unpolished on both surfaces).
6. Other Acceptable Manufacturer: Vetrotech Saint-Gobain.

B. (GL-62) Laminated Ceramic Glazing: Proprietary product in the form of two lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch (8-mm) nominal thickness; polished on both surfaces; weighing 4 lb/sq. ft. (19.5 kg/sq. m); and as follows:

1. Fire-Protection Rating: As indicated for the assembly in which the glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
2. Polished on both surfaces, transparent.
3. Product: Subject to compliance with requirements, provide "FireLite Plus" manufactured by Nippon Electric Glass Co., Ltd. and distributed by Technical Glass Products.
4. Other Acceptable Manufacturer: Vetrotech Saint-Gobain.

2.7 MIRRORS

A. (GL-91) Unframed Clear Glass Mirrors: Conforming to ASTM C1503, Mirror Select Glazing Quality. 1/4 inch thick (6.0 mm) Type 1, Class 1, Quality q1. Manufacture using copper-free and low-lead mirror coating process. Provide 5 year warranty.

1. Edge Treatment: Polished mitered edges.
2. Mounting Accessories: Brushed stainless steel (Type 302) mirror clips similar to KV277 at bottom and KV278 at top where indicated.
3. Concealed fasteners: Mirror mastic as recommended for applicable for specific substrate and mirror configuration, unless otherwise indicated.

2.8 ACCESSORIES

A. Framing for Butt Glazing: Aluminum or stainless steel angles as indicated. Anchor to ceiling and floor substrates with appropriate fasteners in locations as indicated.

B. Setting Blocks: Neoprene, 80 to 90 shore "A" durometer hardness, chemically compatible with glazing sealant or compound, length as recommended by glass manufacturer.

C. Spacers and Shims: Neoprene, 40 to 50 shore "A" durometer hardness, chemically compatible with glazing sealant or compound, length as recommended by glass manufacturer.

D. Glazing Tape: Butyl or silicone preshimmed tape similar to Tremco 440 Tape.

2.9 EXTERIOR GLAZING

A. Glazing gaskets, sealant backers within glazing pockets, and continuous glass spacer pads at structural silicone shall be black heat cured silicone rubber conforming to ASTM C1115-00, Type C. Norton V2100 Thermalbond Tape is acceptable as a glass spacer pad when used in conjunction with structural silicone.

B. Gaskets for dry glazed system shall be silicone, EPDM, neoprene or Santoprene. Sponge gaskets shall be extruded black neoprene with hardness of 40 +/- 5 durometer Shore A and conforming to ASTM C 509-00. Design sponge gaskets to provide 20% to 35% compression. Dense gaskets shall be black extrusions with Shore A hardness of 75 +/- 5 for hollow profiles and 60 +/- 5 for solid profiles, and conforming to ASTM C1115-00, Type C or to ASTM C 864-99. Injection mold corners of gaskets where compatible with installation procedures.

C. Structural Glazing System:

1. Sealant: GE Ultraglaze SSG 4000 by General Electric or 795 by Dow Corning. Verify compatibility of sealant with secondary seal of dual seal insulating glass system.
2. Maximum design stress on Structural Silicone Sealant shall not exceed 20 ps

2.10 INTERIOR GLAZING

A. Type and Manufacturer: Mono one-part acrylic-terpolymer sealant or Proglaze silicone sealant by Tremco, color as selected from manufacturers standard colors.

B. Other Acceptable Manufacturers: General Electric, DAP, PTI, Pecora.

C. Fire-Rated Glazing System: As recommended by fire-rated glass manufacturer.

D. Butt Glazing System: Tremco silicone structural "butt" glazing system, color as selected from manufacturer's standard range.

2.11 FABRICATION

A. Heat-Treated Float Glass: ASTM C 1048. Fabricate using horizontal roller heating process only. Roll wave distortion parallel to bottom edge of glass as installed. Deviation from flatness at any peak (peak to valley deviation): shall not exceed 0.003 inches in the center of a lite and shall not exceed 0.008 inches within 10.5 inches of the leading or trailing edge.

B. Insulating Glass Units:

1. Fabricate using both primary and secondary seals and as otherwise required to comply with the IGCC CBA classification.
2. Fabricate using glass from the same manufacturer throughout the Project.
3. Seal Construction: Dual seal design with primary seal of PIB and Silicone Secondary Seal, unless specifically indicated otherwise.

A. Edge Finishing: Fabricate finished edges to produce smooth, polished edges without chips, scratches, or warps.

1. Non-Exposed Finished Edge, Typical: Flat polished.
2. Butt-Glazed Lites: Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
3. Exposed Edges: Grind smooth and polish exposed glass edges and corners, unless noted otherwise.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify glazing channels are free of burrs, irregularities, and debris.
2. Verify glass is free of edge damage or face imperfections.
3. Inspect door and frames to determine that frames, sash, and stops are set true and straight. Sash rabbets and stops shall be clean and dry at time of glazing.
4. Do not proceed until unsatisfactory conditions have been corrected.

B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Provide glass manufacturer's recommended edge clearances when sizing glass.

B. Remove protective coatings from surfaces to be glazed.

C. Clean glass and glazing surfaces to remove dust, oil, and contaminants, and wipe dry.

D. Verify measurements of sash and openings at Project.

1. Dimensions shown or indicated are given only as a guide for estimating purposes, and actual size shall be determined by measurement of the actual openings. Accurately cut glass to fit openings with proper clearances and setting block height.

E. Coordinate with and check Shop Drawings furnished by other suppliers of Work affecting this Section to avoid field installation problems.

F. Before glazing metal sash, remove oil, lacquer, or other material to which the compound will not readily adhere or which will tend to delaminate from metal and cause a leak through the glazing seal.

3.3 INSTALLATION

A. Comply with glass fabricators recommendations.

B. Except where curtain wall, window, entrance or glass manufacturer recommends otherwise, comply with Flat Glass Marketing Association (FGMA) Sealant Manual and FGMA Glazing Manual.

C. Glaze insulated units as recommended by glass and frame manufacturers.

D. Do not apply glazing materials at temperatures below manufacturer's recommendations or to damp or frosted surfaces. Apply glazing material according to the manufacturer's instructions using proper primers as required.

E. Set glass using neoprene setting blocks and spacers to insure proper edge clearance and uniform beads of compound. Clearances shall conform to FGMA Glazing Manual requirements. Center glass in glazing rabbets.
   1. Butt glazing requirements: Apply mildew resistant silicone sealant to flush depth of joint as indicated by sealant manufacturer.

F. Check openings to confirm proper clearance at perimeters and between glass and stops.
   1. Clean surfaces of rabbet (including stops) and surface of glass which will come into contact with sealant. Use solvents and methods which insure clean, dry surfaces without film or foreign material when sealant is placed.

G. Remove and replace glazing beads carefully to avoid marking or defacing any portion of frame, sash, or fastenings.
   1. Set glass in full bed of glazing tape or sealant. Clean glazing material after stops are installed. Clean excess compound, etc. from glass after setting in conformance with glass manufacturer's recommendations.
   2. If recommended prime surfaces prior to glazing.

H. Set glass with reams (waves) running horizontally. Set glass with factory attached labels in place.

I. Setting Blocks: Place setting blocks at locations recommended by glass manufacturer, generally between 1/4 points and 6 inches from corner, except at glazed doors.
   1. At glazed doors, provide one block at sill, located 3 inches up from edge of glass at hinge side; one block at hinge side jamb, located 3 inches up from lower edge of glass; one block at head, located 3 inches from edge of glass at latch side of door; and, one block at jamb at lock side of door, located 3 inches down from edge of glass at top corner.
   2. Use blocks of length required to properly support glass. Offset approximately 1 inch from shims.

J. Glass Installation in Steel (Hollow Metal) Frames:
   1. Glaze frames using pre-shimmed tape on both sides. Firmly glaze in place with joints sealed, free of rattles.
   2. Set glass on setting blocks with a full bed of sealant or glazing tape.

K. Glass Installation in Aluminum Frames:
   1. Glaze aluminum frames using preformed EPDM elastomeric glazing extrusion separately or in combination with sealant and pre-shimmed glazing tape in compliance with aluminum frame supplier's recommendations.
   2. Set glass on setting blocks as recommended by manufacturer.
   3. Apply tape and/or sealant to produce uniform sight line even with frame.
   4. Set glass in gaskets with corners sealed.

L. Glazing Sealant: Along entire bottom edge of light, and up at least 6 inches at each jamb, gun in continuous full bed of sealant to fill voids.
   1. Fill entire space, full width of pane, full depth of glass, with sufficient sealant to form heel along inside face and edge of glass.

2. At other edges (top and sides) gun in continuous heel bead of sealant along edges of glass perimeter to set stop against and into, acting as fill between glass and stop.
3. Immediately after setting glass, at entire perimeter of glass, gun in sealant between stop and glass so space above spacer is completely filled, without voids.
4. Place sealant flush with daylight edge of stops, with slight watershed at exterior. Provide straight, smooth surface meeting at opening corners with sharp intersection.
5. Leave no sealant on exposed surfaces of stops and glass.

M. Apply structural sealant carefully in uniform thickness pushing bead ahead of nozzle and making sure that entire cavity is filled. Air pockets or voids along edges are not acceptable.
1. Tool joint immediately after application.
2. Tool neatly, forcing sealant into contact with joint sides, eliminating internal voids and insuring good substrate contact.
3. Do not tool with soap or detergent solutions.
4. Install silicone structural butt glazing system in accordance with manufacturer's printed instructions.

N. Mirror installation: As indicated.
1. Adhere mirrors to substrate with mirror mastic.

3.4 CLEANING

A. Remove surplus materials.

B. Final cleaning of glass by Contractor.

END OF SECTION

SECTION 133413
GLAZED STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Point supported structural glass entry canopy system AESS steel, glazing, integral gutter/downspout system and associated work.
      a. Design, engineering, fabrication and installation shall be a single source responsibility.
   2. Anchors, brackets, and attachments.
   3. Flashing to adjoining work.
   4. Sealant.

B. Related Sections:
   1. Section 033000 - Cast-in-Place Concrete.
   2. Section 079000 - Joint Sealers.
   3. Section 088000 - Glazing.
   4. Electrical.

1.2 SYSTEM DESCRIPTION

A. The extent of the point supported structural glazing, AESS steel and associated entry canopy work as defined above is shown on the architectural and structural drawings.

B. The work includes the following:
   1. Engineering design of the structural glazing and accessory parts by the Specialty Glazed Structure Contractor, including structural calculation submittals.
   2. Fabrication, packaging and delivery to job site.
   3. Installation by an installer approved by the Specialty Glazed Structure Contractor or under the direction of a technical advisor of that Contractor.

1.3 DESIGN CRITERIA AND PERFORMANCE

A. System to provide for expansion and contraction within system components caused by cycling temperature range of +/- 60 F degrees without causing detrimental effects to system or components.

B. Design and size members to withstand dead loads and live loads caused by snow, hail, and pressure and suction of wind acting vertically as calculated in accordance with applicable Building Code, as measured in accordance with ASTM E330.
   1. Applicable Building Code: The Kentucky Building Code, Ninth Edition, 2007, Second Printing Adopts 2006 International Building Code with Kentucky Amendments.

C. Loading Design; Allowable Stresses: Design members to carry following loads:
   1. Dead load as required by construction.
   2. Snow load – Per applicable Building Code.
   3. Wind load – Per applicable Building Code.
   4. Concentrated load – Per applicable Building Code.
   5. Seismic Load – Per applicable Building Code.
   6. Temperature variation: +/- 120 F degrees.
   7. Loads created by installation techniques and lifting devices.
   8. Maximum Allowable Deflection: 1/360 (live load) and 1/240 (dead plus live load) of clear span. Design steel members in accordance with current American Institute of Steel Construction Specifications. Limit mullion deflection to 1/360 (live load) and 1/240 (dead plus live load), or flexure limit of glass with full recovery of glazing materials, whichever is less.

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

1.4 REFERENCES

A. AISC - Specification for Design, Fabrication and Erection of Structural Steel for Buildings.

1.5 SUBMITTALS

A. Submit in accordance with Section 013000:
   1. Structural Calculations: Prior to fabrication of the structural glazing, submit design calculations prepared in accordance with current design rules for structural glazing and applicable codes as called for by the Project Engineer. Include analysis and design for all combinations of load cases such as live, dead, wind, thermal, snow, and seismic loading. Professional Engineer shall be licensed in the State where project is located.
      a. Supply structural reactions in each axis, at each typical support, for review and acceptance by the Project Engineer, and the maximum glass deflections in all axis.
      b. Supply calculations for support and other details as necessary.
      c. Panel thickness shall be sized by the Structural Glass Contractor.
      d. Existing text reports are only acceptable as proof of capacity calculations, but will not be acceptable in lieu of calculations.
      e. Engineering Responsibility: Calculations shall be reviewed for stated design assumptions, general compliance to specified requirements, and forces imposed on the foundations. The accuracy of the design calculations shall be the sole responsibility of the Contractor's Professional Engineer.
   2. Shop Drawings: Submit complete shop drawings including glass panel layouts and details. Show dimensioned layout of structural glazing in relation to adjacent work such as walls, columns, beams, slabs, etc. Shop drawings shall be signed by the Contractor's Professional Engineer.
      a. Include details of all supports and data to show provisions for vertical and horizontal expansion/contraction and building movements as necessary.
      b. Identify all materials, attachments devices and accessories including necessary tolerances.
   3. Installation Drawings: After approval of shop drawings, provide a detailed set of field installation drawings and a written installation procedure. Identify each part by size and number.
   4. Product Data: Material description for tapes, compounds, gaskets and other material.
   5. Samples:
      a. Submit samples of glass and glazing materials required for the project.
      b. Samples of glass shall be 12" x 12".
      c. Samples of sealants or gaskets shall be 12" long.
      d. Submit samples of fixing hardware assemblies, bolts and accessories.
      e. Samples of steel with finish paint in selected color(s) shall be 12" x 12".

1.6 QUALITY ASSURANCE

A. Specialty Glazed Structure Contractor Qualifications:
   1. The Specialty Glazed Structure Contractor shall provide in-house services which include full design, engineering and installation service for the structural glazing as a single entity. Subcontracting with outside sources for any of these services is not acceptable. The assembly of joint ventures to provide these services is also not acceptable.

B. Project shall be tendered by, contracted for and managed directly by the Specialty Glazed Structure Contractor. Tenders or project management by a sales agent, intermediary, glazing contractor, agent or distributor of the listed Specialty Glazed Structure Contractor is not acceptable.

C. Provide IAS certification for a welded steel system prior to bid. Proof of IAS certification must be submitted with bidding proposal.

D. Pre-Qualification data is required no later than ten (10) days before bid. Only pre-approved companies (referred to herein as Structural Glass Contractors) demonstrating equivalence in every aspect of the specifications shall be allowed to bid the work.
   1. Provide a list of at least 10 completed projects using the specified systems or equal. All submitted projects must demonstrate the inclusion under one contract, of supply and installation of point supported glazing and steel support system. For each project, submit photographs showing detail of installations. Submit proof of five (5) years of relevant experience and the financial ability to perform work.

E. Safety Glass: Where safety glass is indicated or required by authorities having jurisdiction, provide the types of products that comply with ANSI Z97.1 and CPSC 16 CFR 1201 Category II.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver and handle system components to prevent damage to finished surfaces.

B. All glass shall be manufactured, crated, stored, handled and shipped in a manner that will provide unscratched and undamaged units delivered to the site. Fittings which engage with the glass shall be individually boxed in a way to protect edges from damage and/or scratching.

C. Time the delivery of materials to the site to ensure uninterrupted progress of the installation work.

D. Store and protect system components in accordance with manufacturer's recommendations.

1.8 WARRANTY

A. Provide 3 year manufacturer's warranty.

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

1.9 PROJECT CONDITONS

A. Field Measurements: Where the system is indicated to fit against walls and other construction, the Structural Glass Contractor shall verify dimensions by field measurements before installation and notify General Contractor of any deviations from approved shop drawings. General Contractor shall correct conditions to comply with the system tolerances specified for the project and as indicated in the approval drawings, which may be tighter than industry standard.

B. Structural glass shall be fabricated in accordance with approved shop drawings which shall include dimensional approval from the Architect and General Contractor.

C. Coordinate fabrication schedule with construction progress to avoid delaying the work.

PART 2 PRODUCTS

2.1 SPECIALTY GLAZED STRUCTURE CONTRACTOR / MANUFACTURER

A. Contractor/Manufacturer: The construction documents are based on the PSG-System and AES-System as manufactured and engineered by Novum Structures of Menomonee Falls, WI (Phone: 262-255-5561). As such, Novum Structures is a pre-approved Specialty Glazed Structure Contractor for the scope described under this section. Other Specialty Glazed Structure Contractors that may be considered as long as in strict accordance with the specifications as follows:

B. System Description (CNPY-1): Entry canopy system is comprised of glass panels which are attached to the structure and have drilled holes such that the glass can be mechanically attached using stainless steel fasteners to the support structure. Joints are comprised of uninterrupted wet silicone with an extruded silicone profile inner compression seal.
   1. Metals for Glazing Attachment

a. To prevent bending stresses at the glass holes, the glass attachment bolts shall be grade A316 stainless steel and able to rotate up to 10 degrees in any direction or to an angle as required by the application. The stainless steel shall be separated from the glass with durable and UV resistant rings. The glass hole ring shall be anodized aluminum without exception and the other rings shall be silicone, nylon or as required. Where rotational fittings are not used, calculations shall be provided that show the glass fixing bolt does not locally impact the glass stresses, and that the connection is able to flex sufficiently in the glass deformed shape without depending on rubber, plastic bushing or similar materials, remaining durable long term. Bolt diameters shall be per structural requirements. Calculations shall back-up tests as evidence of compliance.
b. Glazing arms for the glass bolts shall have provisions for glass thermal movements and resist all design forces. Materials shall be either cast or plate A316 stainless steel in electro-polished or satin finish. Alternatively mild steel plate material, in a galvanized and painted finish to prevent corrosion from sliding surfaces, maybe used.
c. The support structure, to hold the glazing arms, shall be of sufficient tolerance to accept the glazing system directly. The required tolerance to be per AISC “Code of Standard Practice” for AESS (or tighter) and shall be indicated in the submittal drawings as required. The connection between glazing arm and support structure shall be designed as mechanical whenever possible.
d. Perimeter Trim and Flashing: At the terminations of the glazing system to other trades, provide stainless steel or painted aluminum trim (as indicated on the drawings) which is secured to the glass to prevent weather penetration. Additional flashing shall be as detailed in the construction documents.

2. Glass
   a. All glass must be fully tempered, clear, laminated glass. Overall thickness of the glass is to be determined by the Specialty Glazed Structure Contractor in accordance with specifications and drawings. Laminated glass is to be produced using a laid-in-place PVB interlayers, 0.030 inch thick in Arctic Snow color plus a 0.030 inch thick clear layer, bonded via an autoclave heat and pressure process. Minimum interlayer thickness is to be 0.060”. All glass must be horizontally tempered, eliminating tong marks. All edges will be ground flat with a frosted appearance unless otherwise noted. All edgework, holes and notches in the tempered glass panels will be completed before tempering and will comply with the requirements stated below:
      1) ASTM C1036 Standard Specification for Flat Glass.
      2) ASTM C1048 Standard Specification for Heat-Treated Flat Glass.
      3) ASTM C1172 Standard Specification for Laminated Architectural Flat Glass.
      4) Safety glazing requirements as defined in ANSI Z97.1 and CPSC 16 CFR 1201.
   b. The Subcontractor shall demonstrate that the stresses induced in the glass by the fittings are compatible with the strength of the glass and the needs of the performance section of this specification, especially at the holes. Provide finite element calculations to show compliance. Pre-stressing of the glass around holes, to a level which is compatible with the design and use of the fittings, is not permissible.
   c. Glass Tolerances: Squareness of panels governs other tolerances and shall be within 3.0 mm of specified dimensions. Edge lengths shall be within 1.5 mm of specified dimensions. Holes shall be within 1.0 mm of specified locations. Bow shall be better than 0.1%.
   d. Glass Holes: Depending on fitting type, drilled holes shall be countersunk or straight through. Fitting type shall be as shown in the architectural drawings. If glass is suspended, fitting shall not be countersunk. All edges of holes shall be cleaned and free of loose or ground materials. In insulated glass units, the holes shall be fully sealed and warranted to perform under applied loads and conditions by the glass manufacturer.

3. Architecturally Exposed Steel Structure
   a. Shall meet the requirements of Division 5, Section “Structural Steel Framing” as amended herein. Sizing and engineering of all members as indicated on the wall and roof area shall be the responsibility of the Structural Glass Contractor.
   b. Anchor rods and imbeds for anchoring structures to foundation; Sizing and engineering shall be responsibility of the Structural Glass Contractor.
   c. Plates and profiles shall typically be A36, A500 Gr. B or as required by the approved calculations and as indicated on the approved drawings.

d. High-Strength Bolts, Nuts and Washers: Provide a standard carbon steel mechanically galvanized or with a dacromet coated finish, as necessary, to avoid nickel sulfide failures and provide corrosion protection.
e. Other Bolts and Nuts: Bolts that are not high-strength or stainless and are subject to corrosive environment, shall be hot dip galvanized, dacromat coated, mechanically galvanized or electroplated. In no circumstances shall bolts without any finish be used, unless noted in the approved drawings.
f. Galvanizing: To be used on HSS purlins that support the glazing system. Apply zinc coating by the hot-dip process to AESS indicated for galvanizing according to ASTM A123 after fabrication. Design hollow sections to provide free flow of galvanizing on interior surfaces; discreet penetrations are permissible. Design and fabricate such that all connections of assemblies are made in the field with bolted connections. Provide galvanized finish on members and assemblies within the range of surface textures presented in the mockups (if performed). At a minimum, remove major runs and surface inconsistencies by careful use of power tools so as to not expose the base metal

4. Coating Specification: Surface Preparation: All surfaces must be cured, clean, sound and free of all mill scale, rust, oil, dirt, grease and any other contamination, including salt deposits, which would interfere with new coating adhesion. Surface may not be wet. Bare surfaces must be properly prepared prior to coating application.
   a. Ferrous Metal Surfaces:
      1) Power or hand washing is required to remove contamination.
      2) Use of a cleaner/degreaser is required to remove any oil or grease.
      3) All cleaning residue must be completely rinsed from surface and surface allowed to dry.
      4) Abrasive blast new steel to SSPC-SP-10 Near-White Blast Cleaning to achieve a 1.5 to 2.0 mil profile.
      5) Blast surface to be primed before flash rusting occurs.
   b. New Galvanized Surfaces:
      1) Solvent wipe to remove surface contamination.
      2) Use a cleaning and etching solution or blast per SSPC-SP-7 Brush-off Blast Cleaning.
   c. Primer:
      1) PPG: Epoxy:
         (a) Product Series: 370.
         (b) Product Name: Amercoat 370.
         (c) One (1) coat application = 3.0 to 5.0 mils DFT (over blast profile).
   d. Top Coat:
      1) PPG: Polyurethane:
         (a) Product Series: 450.
         (b) Product Name: Amercoat 450.
         (c) One (1) coat application = 2.0 to 3.0 mils DFT.
            (i) Total Dry Film Thickness = 5.0 to 8.0 mils DFT.
            (ii) Volume Solids Calculated = 90% plus/minus 3%.
            (iii) VOC as per EPA Method 24 = 0.7 lbs/gallon.
   e. Color: Custom mica color to match Section 084400 Curtain Wall.
5. Stainless Steel Tension Rods
   a. All rods shall be stainless steel with a machined satin finish. End elements shall be clevis type and attach per the methods details shown on the drawings.
6. Sealants: All glass shall be sealed with Dow Corning 795 Silicone Building Sealant in a black color. Backer material in joint shall be provided by an extruded black silicone profile material.
   a. Type: One-component, neutral-cure, RTV (room temperature vulcanizing) silicone rubber sealant for structural glazing. Sealant material shall meet or exceed the following standards:
      1) ASTM C920, Type S, Grade NS, Class 50, Use NT, G, A and O.
      2) ASTM C1184, Type S, Use G, A, and O.
      3) GSA CID A-A-272A – Sealing Compound: Silicone Rubber Base (For caulking, Sealing, and Glazing in Buildings and Other Structures)
      4) GSA CID A-A-1556-Sealing Compound Elastomeric Type, Single Component (For Caulking, Sealing, and Glazing in Buildings and Other Structures)
         (a) Shelf Life: 12 months.
         (b) Tack-free time: 3 hours.
         (c) Working time: 20 to 30 minutes.

(d) Curing time: 7 to 14 days.
(e) Full adhesion time: 14 to 21 days.
(f) Flow, sag, or slump: 2.5mm tested in accordance with ASTM C639.
(g) Volatile organic compound (VOC) content: 28grams/liter
(h) Cured Sealant Properties after 21 days at 50% relative humidity:
    (i) Joint movement capability: Plus and minus 50%, tested in accordance with ASTM C719.
    (ii) Hardness: 35-durometer hardness, Shore A, tested in accordance with ASTM D2240.
    (iii) Maximum Peel Strength: 5.7kg/cm testing in accordance with ASTM C794.
    (iv) Staining: None on concrete, marble, granite, limestone, and brick, when tested in accordance with ASTM C1248.
    (v) Service Temperature Range: Minus 40 to Plus 300 degrees F.

PART 3 EXECUTION

3.1 EXAMINATION

A. Scope of this section includes the installation of structural glass, point support glass fixings, support steel and accessories. The Erector shall check all metal components upon delivery for dents, gouges or other imperfections which may result in rejection of the appearance or reduce strength.
B. The Erector shall check the glass panels upon delivery for scratches, imperfections and edge damage. Damaged glass shall not be installed.

3.2 PREPARATION

A. Coordinate dimensions, tolerances, and method of attachment with other work.
B. Provide connections for temporary shoring, bracing and supports as noted on the installation drawings. Handle, lift and align pieces using padded slings, suction cups and/or other protection required to maintain the appearance of the system throughout the installation process.
C. Lift structure and glass at connections as approved by the system's Design Engineer.

3.3 INSTALLATION

A. Install system in accordance with manufacturer's instructions.
B. Use method of attachment to structure permitting sufficient adjustment to accommodate construction tolerances and irregularities.
C. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Provide expansion joints where required.
D. Provide alignment attachments and shims required to permanently fasten system to building structure.
E. Align assembly free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
F. Set column base plates with non-shrink grout to full plate bearing. Coordinate with other trades.
G. Erect structural glazing and accessory items in strict accordance with the approved shop/installation drawings and installation procedures.
    1. Glass shall not be positioned by the use of force. Provide temporary bracing and support as required to ensure stability during installation process.
    2. Bolt Head Orientation: All exposed bolt heads shall be oriented as indicated on the approved drawings. Where bolt head alignment is specified, the orientation shall be noted for each connection on the installation drawings. Where not noted, the bolt heads in a given connection shall be oriented to one side.

3. Field Welding: If required at glazing arm supports, weld profile, quality and finish shall be consistent with the quality of any shop welds. If not visible, then welds shall comply with visual appearance specified in AWS D1.1. Weld size shall be per the approved shop drawings. Glass must be protected from heat and splatter.
4. All bolts shall be fully tightened in accordance with methods indicated in the installation drawings. Specified pre-stressed bolts shall be tightened using the necessary tools and the torques checked. Reset calibrations often to ensure torque is accurate.
5. Clean glazing connectors receiving glazing materials of deleterious substances that might impair the work. Remove protective coatings that might fail in adhesion or interfere with bond of sealants. Comply with the manufacturer's instructions for final wiping of surfaces immediately before the application of primer and glazing sealants. Wipe metal surfaces with an appropriate cleaning agent.
6. Sealants: Prime surfaces that are to receive glazing sealants in accordance with the manufacturer's recommendations, using recommended primers.
7. Locate setting blocks, if required by the drawings, at the quarter points of the sill, but no closer than 6 inches to corners of the glass. Use blocks of proper sizes to support the glass in accordance with the manufacturer's recommendations.
8. Ensure neoprene spacers separate the glass from attachment plates.
9. Set the glass in a manner that produces the greatest possible degree of uniformity in appearance. Face all glass, which has a dissimilar face, with matching faces in the same direction. Carefully remove all stickers and clean affected area.
10. Use masking tape or other suitable protection to limit the coverage of glazing materials on the surfaces intended for sealants.
11. Tool the exposed surface of glazing materials.
12. Clean excess sealant from the glass and support members immediately after the application, using solvents or cleaners recommended by the manufacturers

H. Structural glazing shall be installed clean and in one visit. General Contractor shall provide protection measures for completed structural glazing and accessories to prevent damage or deterioration from subsequent work.

I. Obtain permission for any modification or field fabrication from the Engineer of the system. Glass cannot be modified.

3.4 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Wall and Roof: 1/8 inch from true position.

3.5 CLEANING

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

B. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer. Use materials non-harmful to glazing.

END OF SECTION