## SECTION 00 01 15

## SHEET INDEX



**END OF SECTION**

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# SECTION 01 35 43

# HAZARDOUS MATERIALS PROCEDURES

## PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 01 - General Requirements, apply to the Work of this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine all the Contract Documents for requirements which effect the Work of this Section.

B. Other Specification Sections which directly relate to the Work of this Section include, but are not limited to, the following:

1. DIVISION 01 - GENERAL REQUIREMENTS; including all Sections contained therein.
2. DIVISION 02 – EXISTING CONDITIONS; including all Sections contained therein.
3. Section 04 20 01 – Masonry Restoration
4. DIVISION 05 – METALS; including all Sections contained therein.
5. Section 06 10 00 - Rough Carpentry
6. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
7. Section 22 00 00 – Plumbing

1.03 HAZARDOUS MATERIALS PROCEDURES

A. Asbestos:

1. Asbestos Materials Exist On-Site: Roofing sampling was performed. Refer to sampling results.
2. The Roofing Contractor shall retain the services of a licensed Asbestos Contractor to perform the work at no additional cost to the Owner.
3. The scope of work includes the removal and proper disposal of all roofing materials including but not limited to roofing tar, flashing, caulking, tar on copper, and other roofing materials. The Roofing Contractor/Asbestos Contractor must comply with DEP 310 CMR 7.15 and DLS 454 CMR 28.
4. Notification: If the Roofing Contractor discover or encounter any ACM during the performance of the work, the Roofing Contractor shall immediately:
   a. Stop work, notify the Owner and OPM about the presence of suspect ACM and request instructions for proper action, and
   b. Take whatever steps and measures are necessary to reduce, control or eliminate the risk of exposure of workers and the public to the ACM.
5. Responsible Person On-Site: The Roofing Contractor shall designate one of its senior on-site employees to oversee coordination between the Architect and all subcontractors

with respect to hazardous materials issues.

6. Responsibility for Hazardous Material Discovery: It is the sole responsibility of the Roofing Contractor to undertake whatever measures, methods of procedures are necessary, required or appropriate to safeguard the health and safety of all workers and members of the public with respect to identification and discovery of previously unknown hazardous materials during the work of the Project.
7. Indemnification: To the fullest extent permitted by law, the Roofing Contractor shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses and expenses including, but not limited to, attorneys' fees arising out of or relating to the performance of the Work, including the discovery or identification of any hazardous materials, provided that any such claim, damage, loss or expense if attributable to bodily injury, sickness, disease or death, or to damage to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom; and is caused in whole or in part by any negligent act or omission of the Roofing Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable regardless of whether or not it is caused in part by a party indemnified hereunder.

B. Lead:

1. The Roofing Contractor shall be made aware that Lead Based Paint exists on painted surfaces throughout the building. No testing was performed.
2. It is the Roofing Contractor responsibility to either test painted surfaces or assume that all existing painted surfaces are coated with Lead Paint. All costs for testing shall be the responsibility of the Roofing Contractor at no additional cost to the Owner.
3. All the work of this Contract shall conform to the standard set by all applicable Federal, State and Local laws, regulations, ordinance, and guidelines in such from in which they exist at the time of the work on the Contract and as may be required by subsequent regulations.
4. The Roofing Contractor is solely responsible for means and methods, and techniques used for lead control.The Roofing Contractor shall collect, control lead contaminated debris and to properly remove and dispose of lead contaminated soil around the building due to Roofing Contractor's and/or the Roofing Contractor's activities.
5. The Roofing Contractor shall at his own cost and expense comply with all laws, ordinance, rules, and regulations of Federal, State, Regional and Local authorities during Demolition, prepping, sanding, cutting, burning, scraping, painting over, grinding and regarding handling, storing, and disposing of lead and lead contaminated waste material.
6. The Roofing Contractor shall submit to the Architect prior to commencing of work the following:
    a. Written respiratory and notification program
    b. Written lead compliance program in accordance with OSHA regulations including:
        1) Training requirement certifications.
        2) Supervisor qualifications.
        3) Written compliance program specific to this project
        4) Respirators fit test records.
        5) Medical surveillance certificates.

7. The EPA and the DEP require Demolition debris with lead to be tested in accordance with the Toxicity Characteristic Leaching Procedure (TCLP) to determine the potential for significant amounts of lead to leach out of the waste. If the results are below the DEP standard (5.0 ppm), the waste may be disposed of in a conventional landfill for Demolition debris. If, however, the TCLP results are above the DEP standard, the waste must be disposed of in a DEP approved, hazardous waste landfill. The Roofing Contractor shall at their own cost and expense perform all required testing of waste by TCLP. The Roofing Contractor must submit to the Owner a copy of tests performed and all waste shipment records prior to disposing of debris. The Owner reserves the right to have own TCLP samples collected to verify results. All disposal costs shall be at the Roofing Contractor responsibility.
8. The following references are cited as current applicable publications. This project is subject to compliance with all regulations including but not limited to:
    a. Commonwealth of Massachusetts, Department of Labor Standards.
    b. Commonwealth of Massachusetts, Department of Environmental Protection.
    c. U. S. Department of Labor, Occupational Safety and Health Administration Title 29 CFR 1910.1025 and 29 CFR Part 1926.62.
9. All the above regulations are applicable to this project. Where there is a conflict between this section and the applicable regulations, the more stringent requirement shall prevail.

C. PCB's:
1. The Roofing Contractor shall be made aware that building materials (Material) including but not limited to painted surfaces, caulking, glue, coatings, and other building materials are likely to contain >1 ppm of Polychlorinated Biphenyls PCB's.
2. EPA does not require testing and therefore, no testing will be performed or permitted to be performed.
3. All the work of this Contract shall conform to the standard set by all applicable Federal, State and Local laws, regulations, ordinance, and guidelines.
4. The Roofing Contractor is solely responsible for means and methods, and techniques used for demolition and control. The Roofing Contractor shall collect and control PCB's contaminated debris and soil.
5. The Roofing Contractor shall at his own cost and expense comply with all laws, ordinance, rules, and regulations of Federal, State, Regional and Local authorities during prepping, sanding, cutting, burning, scraping, painting over, grinding and regarding handling, storing, and disposing of contaminated waste material and during demolition of the building.

E. Silica Dust:
1. The Roofing Contractor shall be made aware that building materials (Material) may contain Silica.
2. Due to the difficulty associated with exhaustive testing, the Owner has elected to direct the Roofing Contractor to assume that Silica was found.

3. The Roofing Contractor shall review and comply with the most recent US Department of Labor Final Rule and shall take extra precautions to protect workers and other personnel on site.

**PART 2 - PRODUCTS** **NOT USED**

**PART 3 – EXECUTION** **NOT USED**

**END OF SECTION**

# SECTION 02 41 13

# SELECTIVE DEMOLITION

## PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 01 - General Requirements, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

A. The Work of this Section includes demolition and disposal of materials to include, but are not limited to the following:
   1. Roof down to existing deck, roof edge, metal coping, and deteriorated roof deck.
   2. Skylight roof, underlayment, copper panels and brackets.
   3. Pavers, patio roof edge, soils, and vegetation.
   4. Mechanical unit, concrete curb, roof hatch, wood blocking, and flashings.
   5. Roof drain, overflow drain, gutters, and downspouts.
   6. Interior parapets, roof ladder, duct, wiring, roof treads, and patio roof edge.
   7. Salvage and store terrace doors, frames, thresholds, and cornice capstones.
   8. Terrace sill flashings, termination bar, roof drain collars, and interior plaster ceilings.

B. Cutting of new openings in existing walls as required to complete the Work, in coordination with the Work of Sections 01 04 50 – Cutting and Patching

C. Scheduling and sequencing operations without interrupt utilities serving occupied areas. If interruption is required, obtain written permission from the utility company and the Owner. Provide temporary services as necessary to serve occupied and usable facilities when permanent utilities must be interrupted, or schedule interruption when the least amount of inconvenience will result.

D. Asbestos materials exist on-site. Stop work and notify Owner and Architect if Contractor encounter any suspected Asbestos Containing Materials (ACM). A licensed Asbestos Contractor shall remove and legally dispose of all ACM materials. Refer to Section 01 35 43 - Hazardous Materials for additional information.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Specification Sections which directly relate to the Work of this Section include, but are not limited to, the following:
   1. DIVISION 01 – GENERAL REQUIREMENTS; including all Sections contained therein.
   2. Section 02 41 13_Selective Demolition
   3. Section 03 30 00_Cast-In-Place Concrete. See Structural Drawings
   4. Section 04 20 01_Masonry Restoration

5. DIVISION 05 – METALS; including all Sections contained therein.
6. Section 06 10 00_Rough Carpentry
7. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
8. Section 22 00 00_Plumbing

1.04 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to the Owner, ready for reuse, at a location designated by the Owner. Protect from weather until accepted by Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated. Protect from weather until reinstallation.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed, and salvaged, or removed and reinstalled.

1.05 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques, antiques, and other items of interest or value to the Owner that may be encountered during selective demolition remain property of the Owner. Carefully remove each item or object in a manner to prevent damage and deliver promptly to a location acceptable to the Owner.

1.06 SUBMITTALS

A. Provide submittals in accordance with requirements of Section 01 33 00 of the Contract Documents

B. Provide qualification data for demolition firms, professional engineers, and refrigerant recovery technicians.

C. Provide schedule of demolition activities, including but not limited to, the following:
   1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity. Schedule shall ensure that the Owner's building and on-site operations are uninterrupted.
   2. Interruption of utility services, including dates and duration of interruption.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Means of protection for items to remain.

D. Provide an inventory list of items that have been removed and salvaged following completion of the Work of this Section.

E. Provide photographs and videotapes showing existing conditions of adjoining construction and site improvements, prior to commencement of the Work of this Section that may be misconstrued as damage caused by the Work of this Section.

1.07 QUALITY ASSURANCE

A. Examination of Existing Conditions: The Contractor shall examine the Contract Drawings for demolition and removal requirements and provisions for new work. Verify all existing conditions and dimensions before commencing work. The Contractor shall visit the site and examine the existing conditions as he finds them and shall inform herself/himself of the character, extent and type of demolition and removal work to be performed. Submit any questions regarding the extent and character of the demolition and removal work in the manner and within the time established for receipt of such questions during the bidding period.

B. Demolition Firm Qualifications: An experienced firm that specializes in demolition work similar in material and extent to that indicated for this Project.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Pre-demolition Conference: Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and require protection.

1.08 PROJECT CONDITIONS

A. Owner Occupancy:

1. The existing auditorium will be occupied during the Work of this Contract. Ensure any impact or disruption to these occupants is kept to a minimum. The General Contractor shall employ all measures necessary to protect the existing buildings and adjacent property from damage caused by the Work of this Contract.

1.09 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

1.10 PRE-INSTALLATION MEETING

A. The General Contractor shall schedule a pre-installation meeting to establish compliance and expectation of Work, maintain optimum working conditions, and coordinate the Work of this Section with related and adjacent Work. The meeting shall be attended by the General Contractor, Architect, and related Subcontractors.

## PART 2 - PRODUCTS

2.01 GENERAL

A. All Repair materials shall be compatible with existing materials to remain and shall be as approved by the Architect.

## PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate, and measure the nature and extent of conflict. Promptly submit a written report to Designer.

E. Engage the services of a professional engineer registered in the Commonwealth of Massachusetts 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 during selective demolition operations.

1. Before selective demolition or removal 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.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

G. Utility Services:

1. Existing utility services shall be maintained to existing facilities. Provide a minimum three (3) day notice of service shutdown to the Owner.
2. Shutting off all utilities shall be conducted by the Contractor in compliance with requirements of authorities having jurisdiction.

H. Site Access and Temporary Controls:

1. Existing streets and walk shall remain open all the time. Maintain all existing building access and egress capabilities as required by local authorities having jurisdiction.
2. Provide and maintain temporary protection, including chain link fencing as necessary.
3. Provide and maintain protection around existing trees and plantings located on adjacent property.

I. Temporary Facilities:

1. Provide and maintain temporary barricades to prevent injury to people.
2. Provide and maintain temporary weather protection as required.

3. Provide and maintain protection of existing finished work to remain.
4. Provide and maintain protection of existing interior furnishings and equipment.
5. Provide and maintain protection of exterior site improvements to remain, including on adjacent property.

J. Provide and maintain temporary weather-tight enclosure for building exterior as required.

K. Provide and maintain temporary shoring of existing structural building components to remain, including but not limited to, structural steel, brick masonry walls, and concrete floors and wood roof framing.

L. Items to be removed and salvaged shall be cleaned, stored, and transported to the Owner's designated storage area.

M. Items to be removed and reinstalled shall be cleaned, repaired, stored, and reinstalled as required.

N. Existing items to remain shall be protected against damage during construction.

O. Cleaning and Disposal: All waste and debris caused by the Work of this Section shall be legally disposed of offsite, daily, at a facility licensed to receive and process building demolition debris. Burning shall not be permitted. Provide original Bills of Lading to the Owner in accordance with the requirements of the Owner.

3.02 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection in accordance with the requirements of Division 01.
2. Always maintain adequate passage to and from all exits. Before any work is done which significantly alters access or egress patterns, consult with the Designer, and obtain approval of code required egress. Under no condition does it block or interfere with the free flow of people at legally required exits, or in any way alter the required condition of such exits.

B. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new support when required during the progress of selective demolition.
2. Remove temporary shoring, bracing and structural supports when no longer required.
3. Post warning signs and place barricades as applicable during placement and removal of temporary shoring.

C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area(s).

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction. Provide temporary barricades as required to limit access to demolition areas.
2. Protect existing site improvements, appurtenances, and landscaping to remain.

D. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

3.03 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering, and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until the work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack items in crates after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to storage area designated by the Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, support, and miscellaneous materials necessary to make item functional for use indicated.

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

E. Items for Re-use and Preservation of Existing Surfaces to Remain:

1. The Contractor shall inspect closely each item specifically designated to be relocated, re-used, or turned over to the Owner prior to its removal, and immediately report damages and defects to the Designer and Owner. The Contractor shall be responsible for any subsequent damage to the same other than latent defects not readily apparent from close inspection and shall bear responsibility for its repair or same replacement as directed by the Designer.

F. Unless special surface preparation is specified under other Specification Sections, leave existing surfaces that are to remain in a condition suitable to receive new materials and/or finishes.

3.04 PROTECTION OF PUBLIC AND PROPERTY

A. Provide all measures required by federal, state, and municipal laws, regulations, and ordinances for the protection of surrounding property, the public, and workmen during all demolition and removal operations. Measures are to be taken, but not limited to installation of sidewalks, sheds, barricades, fences, warning lights and signs, trash chutes and temporary lighting.

B. Protect all walks, roads, streets, curbs, pavements, trees, and plantings, on and off premises, and bear all costs for correcting such damage as directed by the Designer.

C. Demolition shall be performed in such a manner that will ensure the safety of adjacent property. Protect adjacent property from damage and protect persons occupying adjacent property from injuries which might occur from falling debris or other cause and so as not to cause interference with the use of other portions of the building, of adjacent buildings or the free access and safe passage to and from the same.

D. Every precaution shall be taken to protect against movement or settlement of the building, of adjacent buildings, sidewalks, roads, streets, curbs, and pavements. Provide and place at the Contractor's own expense, all necessary bracing and shoring in connection with demolition and removal work.

E. Remove portions of structures with care by using tools and methods that will not transfer heavy shocks to existing and adjacent building structures, both internal and external of the work area.

F. Provide and maintain in proper condition, suitable fire resistive dust barriers around areas where interior demolition and removal work is in progress. Dust barriers shall prevent dust migration to adjacent areas. Remove dust barriers upon completion of major demolition and removal in the work area.

3.05 DISCOVERY OF HAZARDOUS MATERIALS

A. If hazardous materials, such as chemicals, asbestos-containing materials, or other hazardous materials are discovered during work, cease work in the affected area only and immediately notify the Designer of such discovery. Do not proceed with work in such areas until instructions are issued by the Designer. Continue working in other areas.

B. If unmarked containers are discovered during work, cease work in the affected area only and immediately notify the Designer of such discovery. Do not proceed with work in such areas until instructions are issued by the Designer. Take immediate precautions to prohibit endangering the containers' integrity. Continue working in other areas.

3.06 CUTTING

A. Perform all cutting of existing surfaces in a manner which will ensure a minimal difference between the cut area and new materials when patched. Use extreme care when cutting existing surfaces containing concealed utility lines which are indicated to remain and bear full responsibility for repairing or replacement of all such utilities that are accidentally damaged.

B. Provide a flush saw cut edge where pavement, curb, and concrete removals abut new construction work or existing surfaces to remain undisturbed.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Comply with requirements of Division 1, and the following.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.08 CLEANING

A. Cleaning adjacent structures and improvements of dust, dirt, and debris caused by the Work of this Section. Premises shall be left in a clean condition and ready to accept alteration work and new construction.

3.09 RUBBISH REMOVAL

A. The General Contractor shall remove and dispose daily of all waste and debris in accordance with the requirements of Section 01 50 00 – Temporary Facilities and Controls.

**END OF SECTION**

# SECTION 04 20 01

# MASONRY RESTORATION

## PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 01 - General Requirements, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

A. The Work of this Section shall include, but not be limited to, furnishing and installation of the following:
   1. Repair or replace damaged and deteriorated brick and stone masonry to match adjacent material.
   2. Repoint mortar joints.
   3. Clean brick and stone masonry with mild masonry/concrete cleaner

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Specification Sections which directly relate to the Work of this Section include, but are not limited to, the following:
   1. DIVISION 01 – GENERAL REQUIREMENTS; including all Sections contained therein.
   2. Section 02 41 13_Selective Demolition
   3. Section 03 30 00_Cast-In-Place Concrete. See Structural Drawings
   4. DIVISION 05 – METALS; including all Sections contained therein.
   5. Section 06 10 00_Rough Carpentry
   6. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
   7. Section 22 00 00_Plumbing

1.04 SUBMITTALS

A. Provide submittals in accordance with requirements of Section 01 33 00 – Submittal Procedures and in accordance with requirements of the Contract Documents.

B. Provide product data for each type of product indicated, including manufacturer recommendations for application and use, and test data substantiating that products comply with requirements.

C. Provide samples for verification, including but not limited to, the following, or as otherwise requested by the Architect:
   1. Full size replacement brick and stone masonry to match existing size, texture, and color.

D. Qualification Data for restoration contractors, including field supervisors.

E. Restoration Program: Provide detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials on building and Project site.

1. If materials and methods other than those indicated are proposed for any phase of restoration work, provide a written description, including evidence of successful use on comparable projects, and a testing program to demonstrate their effectiveness for this Project.

1.05 QUALITY ASSURANCE

A. Engage an experienced masonry restoration to perform work of this Section. Firm shall have completed Work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.

1. Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that brick restoration and cleaning are in progress. Supervisors shall not be changed during Project except for causes beyond control of restoration specialist firm, as approved by the Architect.
2. Restoration workers shall have a minimum of ten (10) years' experience in restoration work of the type to be performed, who is trained and certified by the approved manufacturer of patching compound to apply its products.

B. Obtain each type of material for the Work of this Section from one source with resources to provide materials of consistent quality in appearance and physical properties.

1.06 DELIVERY, STORAGE, AND HANDLING

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

B. Store materials on elevated platforms, under cover, and in a dry location. Do not use materials that have become damp.

1.07 PROJECT CONDITIONS

A. Perform the Work of this Section in accordance with the written requirements of the approved manufactures of materials to be utilized to complete the Work of this Section, including hot and cold weather requirements.

1.08 SEQUENCING AND SCHEDULING

A. Order repair and replacement materials as soon as possible, to avoid delaying completion of the Work.

B. Perform brick and stone repair and restoration in accordance with the written requirements of the approved manufacturer of materials to be utilized to complete the Work of this Section.

1.09 PRE-INSTALLATION MEETING

A. The General Contractor shall schedule a pre-installation meeting to establish compliance and expectation of Work, maintain optimum working conditions, determine acceptable mock-ups, and coordinate the Work of this Section with related and adjacent Work. The meeting shall be attended by the General Contractor, Owner's Project Manager, Architect, and related subcontractors.

**PART 2 - PRODUCTS**

2.01 MASONRY REPLACEMENT

A. Provide face brick conforming to ASTM C 216, Type FBS Grade SW. Brick shall be cored and solid brick units to match adjacent brick size, finish, texture, and color. Brick units shall meet the following guidelines:

1. Grade SW for all Work
2. Color/Finish/Texture: To match adjacent material size, finish, texture, and color.
3. Solid Lintel Brick Units: Use solid bricks where required so cores shall not be visible after final installation.
4. Min. Compressive Strength: 9,000 psi
5. Max. Saturation Coefficient: 0.78

B. Provide cast stone masonry units to match adjacent stone size, finish, texture, and color. The stone masonry shall comply with the requirements of ASTM C 1364 with the following physical properties:

1. Compressive Strength: 6,500 psi at 28 days, in accordance with ASTM C 1194
2. Absorption: 6 percent maximum at 28 days by cold water method, in accordance with ASTM C 1195
3. Linear Shrinkage: No greater than 0.065 percent, in accordance with ASTM C 426
4. Density: Greater than 120 pounds per cubic feet, in accordance with ASTM C 140
5. Freeze-Thaw: Less than 5 percent cumulative mass loss after 300 cycles, in accordance with ASTM C 666

2.02 MORTAR REPLACEMENT

A. Mortar

1. Comply with ASTM C270 and BIA-M1-88.
2. Provide Type I Portland cement. Masonry cement shall not be used as a substitute.
3. Preconstruction testing with the proportions carefully monitored is to be used to establish the upper end of the strength range of the mortar, which should generally be near the minimum strength of the next higher strength mortar.

4. The maximum strength of each mortar shall generally not exceed the minimum strength of the next higher strength mortar type. The preconstruction testing will determine the general range of strengths to be found and may end up higher than the threshold above.
5. The air content of mortar shall be less than 12%.

B. Rebuilding/Setting Mortar; Type N: 1 part Portland cement, 1 part lime, 6 parts dry sand. Minimum compressive strength shall be 750 psi.

C. Repointing Mortar: Comply with ASTM C 270, X3 Tuck Pointing Mortar.
1. Brick: (Type O) 1 part Portland cement, 2 parts lime, 7 parts dry sand. Minimum compressive strength shall be 350 psi.
2. Stone: (Type N) 1 part Portland cement, 1 part lime, 6 parts dry sand. Minimum compressive strength shall be 750 psi.

D. Mortar Color
1. Mortar color and texture shall match adjacent color. White Portland cement and colored aggregates like existing may be used as required to accomplish the matching of mortar color desired.

2.03 STONE REPAIR

A. Use a two-component, lime-based, latex modified mortar for the restoration of historic masonry, Historic Restoration Mortar, as manufactured by Bonstone Materials Corporation, or equal. Compressive strength of 1433 psi, Flexural strength of 494 psi, Moisture vapor permeability of 55.2 perms (ASTM E-96), Shrinkage of 0.24% (ASTM C157).

B. Use shall be suitable for skim coats and repairs up to a maximum thickness of 1 in. per application. Thicknesses greater than 1 in. shall use multiple layering applications.

C. Color: shall match historic stone masonry that is being repaired.

2.04 CLEANING

A. Use non-acidic gel cleaner with standard gel formulation between 6 and 9 pH, Sure Klean 942 Masonry Cleaner, as manufactured by ProSoCo, or equal.

B. The water for cleaning shall be potable. Heat water to a temperature of 140 to 160 deg F as required to comply with the approved manufacturer's written requirements.

C. Job mixed detergent solution shall be prepared by mixing 2 cups of tetrasodium polyphosphate (TSPP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gallons of solution required.

D. Job-mixed mold, mildew, and algae remover shall be prepared by mixing 2 cups of tetrasodium polyphosphate (TSPP), 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of hot water for every 5 gallons of solution required.

## PART 3 - EXECUTION

3.01 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from stone restoration work.
   1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Prevent mortar from staining the face of surrounding masonry and other surfaces.
   1. Cover sills, ledges, and projections to protect them from mortar droppings.
   2. Keep the wall area wet below rebuilding and pointing work to discourage mortar from adhering.
   3. Immediately remove mortar in contact with exposed masonry and other surfaces.
   4. Clean mortar splatters from scaffolding at the end of each day.

3.02 MIXING PROCEDURE FOR MORTAR

A. Measure material by volume or equivalent weight. In measuring by volume, use a container to measure ingredients. Do not measure with a shovel.

B. Rebuilding / Setting Mortar
   1. Mix ingredients in a clean mechanical mixer for a minimum of 3 minutes, maximum of 5, with the minimum amount of water to produce a workable consistency.
   2. Mortar that has stiffened because of evaporation of water from the mortar may be retempered only once, and only during the first hour of placement to restore the required consistency. Use the mortar within 21/2 hours of its initial mixing; tempering is permitted only once and during the first hour only. Limit the amount of mortar batched at one time to stay within these requirements.

C. Pointing Mortar
   1. Add sufficient water to dry mix to produce a damp mix that will retain its shape when pressed into a ball by hand. Mix from 3 to 7 min. in a mechanical mixer.
   2. Let mortar stand for not less than 1 hour nor more than 1½ hours for prehydration. Add sufficient water to bring mortar to proper consistency for tuck-pointing, somewhat drier than mortar used for laying units.
   3. Use mortar within 2½ hours of its initial mixing; tempering is permitted only once after bringing mortar to proper consistency. Limit the amount of mortar batched at one time to stay within these requirements.

D. For prepackaged masonry repair mortar, mix with water or manufacturer's polymer in proportions defined by manufacturer to provide the required consistency.

3.03 REPOINTING JOINTS

A. The Contractor shall take all precautions required to ensure the original appearance of the building is maintained (not changed) and the existing brick is not damaged. The new mortar shall match the original in color & texture and the new joint shall match the existing joint tooling, size, and profile. For joints that are set back from the brick face (raked joints), provide a sloping joint starting at the original depth at the top and sloping to the brick face at the bottom that will prevent water sitting on the brick while maintaining the intended shadow line.

B. Rake or cut out joints to a minimum uniform depth of 3/4" and until sound surface is reached. Do not spall edges of masonry units or widen joints. Replace all brick damaged by such operations with new to match color, size, and texture.

1. Mortar Removal
    a. Where cutting is required to remove existing mortar and joint filler, use a rotary power masonry saw wherever possible without damaging masonry. Masonry saw shall have a vacuum attachment to reduce dust. Use non-power tools for vertical brick joints or where rotary power masonry saw will damage joint.
2. Cut the mortar and joint filler cleanly from the sides of the joints, leaving square corners. Flush joints clean with water or compressed air.

C. Dampen joints slightly before the application of mortar, making sure there is no free water. Pack pointing mortar tightly in joints in thin layers (1/4" max.), with each layer "thumbprint hard" before applying the next layer. Tool joints match existing adjoining joints.

D. Where joint sealant is required, backpack the joints tightly out to a uniform depth of 1/4", or as indicated on Drawings. Refer to Section 079200 for sealants. Apply bond breaker tape prior to installing sealants.

1. Cure mortar by maintaining it in a damp condition for at least 72 hours.

3.04 REPLACING MASONRY UNITS

A. The Contractor is responsible for performing Work in a safe manner. Provide temporary shoring or other support as required to prevent displacement of existing masonry that is to remain. Perform the removal Work with such care as may be required to prevent failure of the masonry or damage to adjoining masonry that is to remain. Follow the method of operation and/or bracing scheme required to be provided in Article 1.04 titled "Submittals".

B. Remove the deteriorated and damaged masonry units to their full depth, including the surrounding joint mortar. Wet masonry to reduce dust. Install helical masonry ties at perimeter of replacement prior to removal as indicated in detail on the Drawings. Wherever possible without damaging masonry, use a rotary power masonry saw for cutting Work. A masonry saw shall have a vacuum attachment to reduce dust. For SHPO designated/landmark buildings, removal of perimeter brick in the area designated for removal shall be done by first cutting the joint utilizing methods. Leave square corners at adjoining masonry that is to remain. Clean joints and cavities by flushing with water or compressed air.

C. Dampen contact surfaces slightly before application of mortar, making sure there is no free water. Install matching masonry units with Type N mortar. Install units to match and align with existing masonry. Maintain bonding and coursing patterns of existing masonry. Use presoaked wood wedges where necessary to properly set the units and maintain uniform matching joints. Backpack and fill joints full of mortar. Finish joints to match existing adjoining joints as described in Art. 3.04- Repointing Joints. Fill open joints in backup. In solid masonry construction, ensure that the entire collar joint is filled between the backup and the face masonry. Collar joint is likely to vary substantially, up to 3" in locations.

D. Install accessories as indicated on Drawings. In cavity wall construction provides mortar mesh directly on flashing, such as at base of wall, and at relieving angles and lintels, with flashing extending at least 6" above top of mortar mesh.

E. Area Face Brick Replacement

1. Single wythes of brick shall be replaced in maximum 4-foot lengths unless indicated otherwise by the "methods of operation" submitted by the Contractor's Engineer.
2. Install reinforcement every 16 in. each way and secure it to backup masonry as indicated on Drawings.

F. Replacement by Brick Stitching

1. Remove and replace existing brick to their full depth with new face brick, one brick each on both sides of crack in masonry. Also, remove and replace all existing pushed-out, missing, split or otherwise defective face bricks to match the adjoining existing good sound masonry. If the existing masonry work has a solid masonry common-bond pattern, existing sound header bricks shall remain. However, any cracked, defective, or loose header brick shall be replaced.
2. All new brick work shall be toothed into existing good work. At horizontal and diagonal cracks, the replacement of bricks shall be done at maximum 4-foot lengths unless indicated otherwise by the "methods of operation" submitted by the Contractor's Engineer as required to be submitted in Article 1.04 titled "Submittals".
3. The existing mortar bed for being replaced with brick shall be thoroughly removed and the back parged with a coat of new mortar to fill the collar joint.

3.05 STABILIZATION OF EXISTING MASONRY WALLS

A. The existing face masonry shall be stabilized to the backup material by means of helical masonry ties. The installation and procedure shall be inspected by the Authority's Representative and the Company Field Representative to verify proper installation of the helical ties.

B. Prior to the start of the Work, the existing conditions shall be examined by a Company Field Representative (CFR) authorized in writing by the manufacturer of the helical ties. The CFR shall instruct the Contractor in the installation of the ties. The CFR shall recommend the diameter, length, type, and spacing of ties and drill bits to be used at each location and masonry condition. The CFR shall submit this information in written or graphic form, through the Contractor, to the Authority for review and approval by the Architect or Engineer of Record.

C. The design spacing of the ties shall typically be 16" vertically and 16" horizontally. Spacing shall be closer where required because of existing conditions, and where pull-out load tests show it to be necessary. Pull-out tests shall be performed at each masonry condition by the CFR prior to the start of the Work, and the results of the tests shall be submitted to the Authority. Separate pull-out tests shall be performed on the face masonry, mortar joints and on the backup material. For tie spacing of 16" x 16" a load of 300 lbs. shall be achieved for the face masonry and for the backup material separately, without failure by loss of resistance or slippage. Where a 500 lbs. test load is achieved for each material separately, it will be permissible to increase spacing of ties to 16" x 24".

D. A pilot hole shall be drilled through the face masonry and into the backup material using a high-speed rotary percussion drill (Bosch model 1194VSR, or equivalent), 3 jaw chuck type. If acceptable pullout results are achieved through the mortar joints, this shall be the preferred method of installation of the ties rather than through the face masonry, particularly for SHPO eligible buildings. At certain conditions, as recommended by the CFR, the drill bit used for the face masonry shall be of different diameter than the bit used in the backup material. The helical tie shall be driven into position using an electric hammer drill with SDS type chuck and specialized insertion tool. The electric hammer drill with SDS type chuck shall not be used for drilling pilot holes in face masonry. The electric hammer drill with SDS type chuck shall only be used for drilling pilot holes in backup material when recommended by the manufacturer such as in concrete.

E. Each wall condition shall be examined by the Architect or Engineer of Record and CFR to determine specific installation requirements. The following is presented as an example of a 10mm diameter tie in face brick with concrete block backup. The installation shall be performed in the following manner, subject to actual project conditions and modification by the CFR:

F. For use of 10 mm helical ties, drill an 8mm-entry\ hole through face brick using high speed rotary percussion drill. (Where location is a mortar joint, drill a 6.5mm hole near the approximate center point of the brick, not at T-joints or ends).

G. Change bits and drill a 6.5mm entry hole through the concrete block backup to a minimum of 3 inches, using high-speed rotary percussion drill.

H. Drive helical tie into place, recessed for final patching, using a setting tool mounted on an electric hammer drill with an SDS type chuck.

3.06 FINAL CLEANING

A. After repairs have completely cured and hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

B. Do not use metal scrapers or brushes, or acidic or alkaline cleaners.

3.07 RUBBISH REMOVAL

A. The General Contractor shall remove and dispose daily of all waste and debris in accordance with the requirements of Section 01 50 00 – Temporary Facilities and Controls.

**END OF SECTION**

# SECTION 06 10 00

# ROUGH CARPENTRY

## PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 01 - General Requirements, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

A. The Work of this Section includes, but is not limited to, provision and installation of the following:
   1. Plywood, wood furring, and wood blocking for all exterior and interior Work
   2. Pressure treated wood framing members and plywood for all wood in contact with concrete or masonry.
   3. Nails, screws, bolts, and fasteners for securing items of rough carpentry installed under the Work of this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Specification Sections which directly relate to the Work of this Section include, but are not limited to, the following:
   1. DIVISION 01 – GENERAL REQUIREMENTS; including all Sections contained therein.
   2. Section 02 41 13_Selective Demolition
   3. Section 03 30 00_Cast-In-Place Concrete. See Structural Drawings
   4. Section 04 20 01_Masonry Restoration
   5. DIVISION 05 – METALS; including all Sections contained therein.
   6. Section 06 10 00_Rough Carpentry
   7. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
   8. Section 22 00 00 - Plumbing

1.04 PURPOSE

A. The Work of this Section shall be to provide concealed blocking, grounds, nailers, and backing panels, for the Work of this Project. Portions of Work related to this Section include, but are not limited to, toilet accessories, handrails and railings, and telephone and electrical equipment.

B. Coordinate the Work of this Section with the Work specified in Sections 07 54 19 - Polyvinyl - Chloride (PVC) Roofing and 07 72 00 - Roof Accessories. Determine which type of blocking, wood, or metal, is best suited to each situation and provide the appropriate type of blocking. Do not use wood blocking in fire-rated assemblies or other locations prohibited by authorities having jurisdiction.

1.05 QUALITY ASSURANCE

A. Lumber Grading Rules and Wood Species to be in conformance with Voluntary Product Standard PS-20; grading rules of the following associations apply to materials furnished under this Section.
   1. Northeast Lumber Manufacturer's Association, Inc.
   2. Western Wood Products Association.

B. Plywood Grading Rules:
   1. Softwood Plywood: Construction and Industrial: Product Standard PS-1.
   2. Hardwood Plywood: Product Standard PS-51.

C. Grade Marks: Identify all lumber and plywood by the official grade mark.
   1. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species grouping or combination designation, rules under which graded, where applicable and condition of seasoning at time of surfacing.
   2. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
      a. Type, grade, class, and Identification Index.
      b. Inspection and testing agency mark.
   3. Hardwood Plywood: Appropriate grade trademark of the American Plywood Association or other qualified testing and grading agency.

D. Requirements of Regulatory Agencies:
   1. Working Stresses: Softwood lumber, National Design Specification; National Forest Products Association.
   2. Pressure Treated Lumber and Plywood: American Wood Preservers Association (AWPA) Standards.
   3. Pressure Treated Material: American Wood Preservers Association Standards.
   4. Fire Classification: Underwriters Laboratories, Inc. FRS for treated lumber and plywood.

1.06 SUBMITTALS

A. Provide submittals in accordance with requirements of Section 01 33 00 – Submittal Procedures and in accordance with requirements of the Contract Documents.

B. Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Provide certifications demonstrating materials comply with requirements of the Contract Documents.

C. Certifications:
   1. Pressure Treated Wood: Submit certification by treating plant stating chemicals and process used, net number of salts retained, and conformance with applicable standards.
   2. Pressure Treated Wood: Submit certification for water-borne preservative that moisture content was reduced to 19 percent maximum, after treatment.

3. Fire Retardant Treatment: Submit certification by the treating plant that the fire-retardant treatment materials comply with governing ordinances and that the treatment shall not bleed through finished surfaces.
4. Fire Treated Wood: Submit certification from the supplier of the fire-retardant treated lumber or plywood attesting that the wood is Dricon wood or satisfies the following:
   a. All pieces of lumber have been kiln-dried to a maximum moisture content of 19 percent or less after treatment. All plywood shall be dried to a moisture content of 15 percent after treatment.
   b. The fire-retardant chemicals used to treat the lumber were free of halogens, sulfates, ammonium phosphate and formaldehyde.
   c. The fire-retardant treated wood does not require brush treatment of end cuts made in the field.
   d. The fire-retardant treated wood has an equilibrium moisture content of not more than 25 percent when tested in accordance with ASTM D3201 procedures at 95 percent relative humidity and 80°F.

1.07 DELIVERY STORAGE AND HANDLING

A. Deliver, store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from moisture and damage. Stack materials to promote air circulation. Protect sheet materials from corner breakage and other damage.

1.08 PRE-INSTALLATION MEETING

A. The General Contractor shall schedule a pre-installation meeting to establish compliance and expectation of Work, maintain optimum working conditions, determine acceptable mock-ups, and coordinate the Work of this Section with related and adjacent Work. The meeting shall be attended by the General Contractor, Owner’s Project Manager, Architect, and related subcontractors.

**PART 2 - PRODUCTS**

2.01 LUMBER

A. Provide kiln dried southern yellow pine or hem-fir construction grade boards, stud grade or no. 2 boards, and structural light framing, complying with applicable requirements of PS 20 “American Softwood Lumber Standards”, and having 19 percent maximum moisture content.

B. Provide above ground lumber and plywood in contact with masonry, concrete and damp proofing that is pressure treated to a level of 0.25 pounds per cubic foot of wood product, with waterborne CCA preservatives in accordance with requirements of AWPA Standard U1 and T1. Pressure treated lumber shall be dried to a maximum moisture content of 15 percent after treatment.

C. Provide UL labeled fire-retardant treated wood in telephone and electrical closets, window framing, and elsewhere as indicated. Provide fire-retardant treatment suitable for interior exposures and comply with AWPA C20. Kiln dry lumber after treatment.

2.02 PLYWOOD

A. Backing panels, interior wall sheathing panels, and continuous or partial partition blocking, shall be APA trademarked, UL labeled, fire-retardant treated, BD, Group 2, Exposure 1 plywood panels not less than 3/4 in. thick at locations of electrical and telephone panels, or 1/2 in. thick for wall sheathing. Panels shall comply with the requirements of PS 1. Plywood shall be fire retardant treated to yield a flame spread rating of not more than 25 when tested according to ASTM E84. Kiln dry after treatment to maximum moisture content of 15 percent.

B. Subflooring: Provide APA trademarked, Exposure 1 Rated and non-rated plywood performance rated sheathing, 3/4 in. thick. Provide tongue and grooved edges. Particleboard and flakeboard are not acceptable.

2.03 FASTENERS AND MISCELLANEOUS MATERIALS

A. Provide size, type, and material appropriate for intended use, as follows:

1. Self-Tapping Screws, surface hardened with a fluoropolymer paint finish equal to Buildex or Stalgard. Threads shall be self-locking to prevent backing out under wind load, vibration, or other stress. A 5/8 in. penetration of the screw through the metal deck is required.
2. Bolts:
    a. Bolts, and nuts shall conform to Fed. Spec. FF-B-571a and FF-B-575, as applicable.
    b. Expansion shields shall conform to Fed. Spec. FF-S-325. Shields shall be accurately recessed and, unless otherwise indicated, shall be not less than 2-1/2 in. into concrete or masonry. Devices of Groups IV, V, VI and VII shall not be used in sizes greater than 3/8 in. unless otherwise indicated.
    c. Lag screws or lag bolts shall conform to Fed. Spec. FF -B-561b.
    d. Toggle bolts shall conform to Fed. Spec. FF-B-588b.
3. Screws: Wood screws shall conform to Fed. Spec. FF-S-111b.
4. Nails: Nails shall conform to Fed. Spec. FF-N-105a. Nails for plywood secured to wood shall be ring or annular type.

B. Provide fasteners with G-90 hot dip galvanized coating, or fluoroploymer coating, at areas of high humidity, including roof blocking and sheathing. Fasteners for use with non-CCA pressure treated lumber, including ACQ Types B and D, CBA-A, and CA-B, shall be stainless steel.

C. Preservative treatment for field cut surfaces of pressure treated blocking and sheathing shall contain 2 percent copper naphthenate complying with AWPA Standard M4. Material shall be Green No. 10, as manufactured by Cuprinol, or equal by WM Barr or Behr.

2.04 FINISHES

A. Paint all surfaces, exposed, and concealed, of plywood backing panels at electrical and telephone panels, and mechanical rooms with fire retardant paint in accordance with requirements of Section 09 91 13 - Painting, and the approved manufacturer's written instructions.

## PART 3 - EXECUTION

### 3.01 INSPECTION

A. The Trade Contractor of this Section shall examine substrates, supports, and conditions under which this Work is to be performed and notify General Contractor, in writing, of conditions detrimental to the proper completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected. Beginning Work means Installer accepts substrates and conditions.

### 3.02 INSTALLATION / ERECTION

A. Strictly comply with National Forest Products Association, *Manual for House Framing* and building codes, except where more restrictive requirements are specified in this Section or indicated on the drawings.

B. Choose wood members carefully to eliminate split, warped, and twisted members. Set Work to required levels and lines with members plumb and true to line with joints neatly and tightly cut and butted. Securely anchor Work in strict compliance with referenced standards and building code nailing schedule. Countersink bolts and other fasteners flush with face of wood to provide a proper substrate for later Work.

C. Blocking shall be provided as necessary for the applications of sheathing, wallboard and other materials or building items, and to provide fire stopping. Blocking shall be cut to fit between framing members and rigidly attached thereto.

D. Saturate cut ends of treated wood with same chemicals used for original treatment.

E. Install nailers and blocking at metal studs as indicated. All wood shall be pressure treated or fire treated as indicated on drawings. Apply two brush coats of the same preservative used in original treatment to all sawed or cut surfaces of preservative treated lumber.

1. Bolt nailers to deck, not over 24 inches on center. Counter sink bolt heads.
2. Screw nailers to studs, not over 12 inches on center.

### 3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Reference Standards: Comply with instructions and recommendations of APA, *Design and Construction Guide - Residential and Commercial* for types of panels, nail size and fastening spacing used and applications indicated.

B. Fasten panels as indicated below:

1. Backerboards: Screw to framing or expansion bolt to CMU.
2. Wall Sheathing: Screw to framing or expansion bolt to CMU.

### 3.04 RUBBISH REMOVAL

A. The General Contractor shall remove and dispose daily all waste and debris in accordance with the requirements of Section 01 50 00 – Temporary Facilities and Controls.

**END OF SECTION**

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# SECTION 07 54 19

# POLYVINYL-CHLORIDE (PVC) ROOFING

## PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 01 - General Requirements, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

A. The Work of this Section includes, but is not limited to, furnishing and installation of the following:
   1. New adhered PVC membrane roofing system including, but not limited to, the following:
      a. Air barrier membrane
      b. Flat and tapered rigid insulation
      c. Sheet membrane roofing and accessories, including walkway pads/grating.
      d. Sealants
   2. Roof blocking and plywood sheathing for membrane securement, including all fasteners.
   3. Flashing membranes, liquid flashings, penetration boots, adhesives, membrane welding equipment, and related accessories required for a complete installation.
   4. 1/2 in. overlayment board.
   5. Self-adhered vapor retarder.
   6. Metal counter flashings, terminations, fastening cleats, and related accessories

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Specification Sections which directly relate to the Work of this Section include, but are not limited to, the following:
   1. DIVISION 01 – GENERAL REQUIREMENTS; including all Sections contained therein.
   2. DIVISION 02 – EXISTING CONDITIONS; including all Sections contained therein.
   3. Section 04 20 01 – Masonry Restoration
   4. DIVISION 05 – METALS; including all Sections contained therein.
   5. Section 06 10 00 - Rough Carpentry
   6. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
   7. Section 22 00 00 – Plumbing

1.04 QUALITY ASSURANCE

A. The roofing system shall be applied for by the Contractor for this Section shall have a minimum 10 years of experience who has been approved and authorized prior to bid, by the approved roof membrane manufacturer.

B. All roof membrane system materials, components, insulation, and accessories shall be the products of a single manufacturer for compliance with requirements of the Contract Documents to provide thirty (30) year, full system warranty.

C. Upon completion of the installation, and at appropriate intervals during installation, an inspection shall be made by a representative of the manufacturer to ascertain that the roofing system has been installed according to applicable manufacturer's specifications and details.

1.05 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7-16. Design wind speed: 134 mph.

1. Field-of-Roof Uplift Pressure: Refer to Drawing A2.00.
2. Perimeter Uplift Pressure: Refer to Drawing A2.00.
3. Corner Uplift Pressure: Refer to Drawing A2.00.

D. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Hail Resistance:MH.

E. Underwriters Laboratories

1. Class A Assembly Rating: UL 1256; Insulated Metal Deck Construction Assemblies – No. 120, 123, 292; UL 790; UL 263 Hourly Rated P Series Roof Assemblies.

1.06 SUBMITTALS

A. Provide submittals in accordance with requirements of Section 01 33 00 – Submittal Procedures, and in accordance with requirements of the Contract Documents.

B. Certificates:

1. Submit certified manufacturer documentation of acceptance of roof membrane system installer.

2. Written certification by the approved manufacturer of roofing and insulation materials that all materials supplied comply with all requirements of the appropriate ASTM Standards, and that all the materials are suitable for the specified roofing system. Certification shall be provided in time to prevent delay in implementation of the Work of this Section.

C. Samples and Shop Drawings:
1. Provide two samples, labeled, of all materials provided under the Work of this Section.
2. Provide shop drawings to include, but not be limited to, the following:
a. Outline of roofs and sizes, showing field, corners, and perimeters
b. Insulation fastening pattern for fasteners and adhesives at field, corners, and perimeter
c. Location and type of all penetrations
d. Perimeter and penetration flashing details
e. Rigid insulation manufacturer brand, thickness
f. Tapered and flat rigid insulation layout
g. Fastener manufacturer, brand, and length
h. Warranty type and period
i. Technical acceptance from membrane manufacturer

D. Provide the manufacturer's most recent edition of material and performance specifications for all materials provided under the Work of this Section.

E. Provide three copies of membrane manufacturer's full system warranty, and three (3) copies of the applicators warranty.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

B. Handle all materials to avoid damage to materials and roof deck. Store rolled goods directed by manufacturer. Discard rolls which have been flattened, creased, or otherwise damaged. Bonding adhesive shall be stored at temperatures above 40°F.

C. All flammable materials shall be stored in a cool dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.

D. Do not allow materials or incomplete roofing Work to be exposed to moisture, anywhere, at any time, during transportation, storage, handling, or installation. Use pallets and tarpaulins to cover all stored material, top to bottom. Secure tarpaulin.

1.08 PROJECT CONDITIONS

A. Perform Work only when existing and forecasted weather conditions are within the limits established by manufacturers of the materials and products used.

B. Only as much of the new roofing as can be made weather-tight each day, including all flashing Work, shall be installed.

C. All Work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks.

D. The membrane manufacturer requires the owner's representative or Trade Contractor for this Section to run pullout tests of fasteners to verify the condition of deck/substrate and confirm pullout values.

E. All surfaces to receive new insulation, membrane or flashings shall be thoroughly dry. Should surface moisture occur, the Trade Contractor for this Section shall provide the necessary equipment to dry the surface prior to application.

F. Temporary water stops shall be installed at the end of each day's Work and shall be removed before proceeding with the next day's Work. Waterstops shall be compatible with all materials and shall not emit dangerous or incompatible fumes. Provide waterstops for all roofing systems described in this specification per manufacturers recommendations.

G. The Trade Contractor for this Section shall provide all necessary protection and barriers to segregate the Work area and to prevent damage to adjacent areas. Plywood protection shall be provided for all new roofing areas which shall receive traffic during construction.

H. Prior to and during application, all dirt, debris, and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air and/or similar methods.

I. Membranes and accessories shall not be exposed to prolonged temperature excess of 160° F.

J. Contaminants, such as grease, fats, oils, and solvents, shall not be allowed to come into direct contact with the roofing membrane. Any unusual exposures shall be presented to the membrane manufacturer for assessment of any impact on the roofing membrane.

1.09 WARRANTY

A. Provide 30-year full roofing system warranty, no cap, non-prorated, transferable, labor and material, manufacturer's warranty to the Owner by the approved roof membrane system manufacturer from date of Final Completion.

B. The Roofing Contractor, as a condition precedent to final payment, shall execute his own written guarantee direct to the Owner, warranting all roofing, base flashing, and sheet metal work to be weather and watertight for a period of two years after date of final completion on the Project. Any imperfections as a whole or in part, by reason of defective materials, workmanship, or arrangement of the various parts at the Trade Contractor's expense.

1.10 PRE-INSTALLATION MEETING

A. The Prime Contractor shall schedule a pre-installation meeting to establish compliance and expectation of Work, maintain optimum working conditions, determine acceptable mock-ups, and coordinate the Work of this Section with related and adjacent Work. The meeting shall be attended by the Prime Contractor, Owner's Project Manager, Architect, Roofing Subcontractors, and Manufacturer's Representatives.

## PART 2 - PRODUCTS

2.01 ROOF MEMBRANE SYSTEM

A. Adhered PVC membrane and flashings as indicated on the Drawings shall be ASTM D 4434, Type III, fabric reinforced, textured PVC sheet membrane S327 bareback as manufactured by Sika-Sarnafil, Inc., or equal by Durolast or Fibertite.Color: Reflective gray.

1. Roof membrane thickness: 80 mils min.
2. Flashing membranes: 60 mils min.

2.02 AIR/VAPOR BARRIER

A. Vapor retarder/temporary roofing: ASTM D 1970, 31 mil min. thickness, self-adhering modified bitumen membrane with release film.

B. Provide primer recommended by vapor-retarder manufacturer.

2.03 ROOF INSULATION AND ACCESSORIES

A. Roof insulation: Isocyanurate insulation, ASTM C 1289, Type II, Class 2, Grade 2 polyisocyanurate insulation approved by the roof membrane manufacturer modified as follows:

1. Facer: Coated glass.
2. Board size: 4 ft x 4 ft or 4 ft x 8 ft.
3. Thickness: Bottom layer 3 in., top layer 3.0 in. Total thickness: 6.0 in.
4. Density: 20 psi minimum
5. Edges: Square

B. Provide compatible tapered insulation to provide valleys, crickets and drain insulation sumps where shown on the Drawings.

1. Crickets: Provide tapered insulation slopes as shown on the Drawings.
2. Insulation Sumps: Tapered insulation slope shall be ½ in per ft. Minimum thickness – 1 in. Maximum thickness – 3 in. Size: 9’-4” x 9’-4”.
3. Valleys: Tapered insulation slope within valleys shall be ¼:12 minimum tapered insulation, unless noted otherwise on drawings.

C. Insulation/Coverboard Attachment:

1. The fastening system shall be 3 in. metal plate and the fastener with greater the uplift resistance as determined by pullout testing, Lite Deck or Polymer Gyptec fasteners with minimum 2-inch deck embedment, as provide by Sika Sarnafil, or equal. Fasteners and fastening plates incorporated in roofing system shall conform to FM 4470 standard and DIN 50018 specification for corrosion resistance.

D. Membrane and Flashing Adhesives and Sealants:

1. Membrane and flashing adhesive shall be VOC compliant as supplied by the approved roof membrane manufacturer for the required substrate. Application rates shall comply with the approved manufacturer's recommendations for the intended substrate.
2. Sealant shall be supplied by the approved roof membrane manufacturer, with color to match the adjacent roof membrane.

E. Elastomeric Flashing:

1. Base flashing shall be compatible with sheet membrane as supplied by the approved roof membrane manufacturer.
2. Pipe seals and prefabricated flashing accessories shall be supplied by the approved roof membrane manufacturer.
3. Molded Pipe Flashing shall be as supplied by the approved roof membrane manufacturer.

F. Provide the following accessory products as manufactured by the approved membrane manufacturer:

1. Provide all clips, cleats, straps, anchors and similar items necessary to properly complete the Work. Provide accessories that are compatible with sheet metal materials used and which are of sufficient size and gage to perform as intended.
2. Provide the approved manufacturer's recommended roof expansion joints at all locations as indicated on the Drawings, or as otherwise required to comply with the approved roof system manufacturer's written warranty requirements.

G. Coverboard:

1. ASTM C 1177, 1/2 in. thick, preprimed water and mold resistant, silicone treated gypsum sheathing or ASTM C 1289, Type II, Class 4, Grade 1 high density polyisocyanurate board provided by roofing manufacturer.
   a. Board dimensions: 4' x 4' or 4' x 8'.

2.04 MISCELLANEOUS ACCESSORIES

A. Expansion Joint Assembly: 2 in. expansion joint with hot-air welded flashing strip, compatible foam rod tubing, Sarnadisc Rhinobond plates, Sarnafastener No. 21, and batt insulation.

B. Aluminum Tape: 2 in. wide pressure-sensitive aluminum tape used as a separation layer between small areas of asphalt contamination and the membrane and as a bond-breaker under the coverstrip at Sarnaclad joints.

C. Multi-Purpose Tape: High performance sealant tape used with metal flashings as a preventive measure against air and wind-blown moisture entry.

D. Seam Cleaner: Used on PVC membranes to clean the in the seam area only.

E. Liquid Flashing: Polymethyl methacrylate-based (PMMA) liquid flashing material and fleece by membrane roofing manufacturer.

F. Peel Stop Perimeter Bar at Base of All Flashings and at Exposed Perimeter of Decorative Rib System: Extruded 1/8 x 1 in. aluminum, low profile bar with predrilled holes on 6 in. centers used to attach to the roof deck or to walls/curbs at terminations, penetrations and at incline changes of the substrate.

G. Miscellaneous fasteners and anchors shall be of the same type as metal being secured. In general, all fasteners, anchors, nails, straps, shall be of zinc or cadmium plated steel, galvanized, or stainless steel. All fasteners and anchors shall have a minimum embedment of 1-1/4 in. and shall be approved for such use by the fastener manufacturer. Fasteners for attachment of metal to wood blocking shall be annular ring nails. Fasteners for attachment of metal to masonry shall be expansion type fasteners. All fasteners shall meet Factory Mutual Standard 4470 for corrosion resistance.

1. Fasteners for attachment of pressure treated blocking shall be stainless steel.

## 2.05 WALKWAY PADS

A. Provide 39 in. wide thermoplastic rolled-out heat welded walkway, ASTM D751, Sarnatred-V as manufactured by Sika, or equal. The walkway pads shall have the following material and performance characteristics:

| | | |
|---|---|---|
| 1. | Overall Thickness: | 0.096 in. |
| 2. | Tensile Strength: | 275 psi |
| 3. | Elongation at Break: | 15 lbf. minimum |
| 4. | Tearing Resistance: | 50 lbf. min. |
| 5. | Low Temperature Bend: | Pass, ASTM D2136 |
| 6. | Fire Resistance: | 25 ft., ASTM E108 |
| 7. | UV Resistance: | 5,000 hrs., ASTM D2565 |
| 8. | Puncture Resistance: | 54 lbs., ASTM 2065 |
| 9. | Recycled Content: | 1 percent post-consumer, 9 percent pre-consumer |

B. Walk-Off Walkway at Roof Access Door

1. Rooftop walkway on located on three sides of roof hatch shall be 5’ wide x 1-1/2 in. open mesh, slip-resistant, non-penetrating fiberglass reinforced plastic (FRP with rubber feet designed to elevate grating ½ in. above roof surface.
   a. Basis of design: Rooftop Walkway Grating by Fibergrate Composite Structures, Dallas, TX.

## 2.06 PLYWOOD AND WOOD BLOCKING

A. Do not use pressure-treated plywood.

B. Provide APA trademarked, Exposure 1 Rated and non-rated plywood performance rated sheathing, 3/4 in. thick, with span rating for spans indicated. Use of particleboard, flakeboard, or oriented strand board (OSB), shall not be allowed. Blocking shall be pressure treated to a level of 0.25 pounds per cubic foot of wood product, with waterborne CCA preservatives in accordance with requirements of AWPA Standard U1 and T1.

C. Wood blocking and nailers shall be in profiles and sizes as indicated on the Drawings or as otherwise required by the approved roof membrane manufacturer and be pressure treated to a level of 0.25 pounds per cubic foot of wood product, with waterborne CCA preservatives in accordance with requirements of AWPA Standard U1 and T1.

## 2.07 RAINSCREEN DRAINAGE LAYER

D. Provide vertically-channeled, three-dimensional, nylon matrix in roll form. Rainscreen shall be installed between plywood and masonry at parapet and headwall conditions.

2. Basis of Design: Slicker Classic by Benjamin Obdyke Incorporated, Horsham, PA.
3. General Characteristics
    a. Width: 39.37 inches (1 m).
    b. Length: 46 1/2 feet (14.2 m).
    c. Thickness: 0.25 inches (6.4 mm).
    d. Weight: 11 lbs/roll.
    e. Matrix Design: 8 channels per 4 inches (102 mm). Two channels per inch (25.4 mm).
4. Performance Characteristics
    a. UV Resistance: UV exposure for 30 days
    b. Thickness: 0.25 inches when tested in accordance with ASTM D5199
    c. Weight: 256 GSM when tested in accordance with ASTM D3776
    d. Tensile Strength: 26 lbf MD, 32 lbf CD, when tested in accordance with ASTM D5034
    e. Short Term Compression: 179 lb/SF, when tested in accordance with ASTM D6364, compressive stress at 10% strain
    f. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 15, Smoke Developed: 50.

## PART 3 - EXECUTION

3.01 GENERAL

A. The Work of this Section shall include coordination of the installation as necessary to ensure each area is made watertight at the end of each Work period.

3.02 DECK PREPARATION

A. The Trade Contractor for this Section shall inspect the roofing surface for defects, including but not limited to, proper anchorage for compliance with required wind uplift resistance ratings, excessive surface roughness, contaminated surfaces, and structurally unsound substrates that shall adversely affect the quality of Work. Do not proceed with application of roofing until defects are corrected, and the surfaces have been approved by a representative of the membrane manufacturer.

B. The substrate shall be clean, smooth, dry, free of flaws, sharp edges, loose and foreign material, oil and grease. Roofing shall not start until all defects have been corrected.

C. Verify that the Work of other trades which penetrates roof deck has been completed, and that nailers have been installed at perimeter and at vents.

D. Remove all materials that could inhibit adhesion or could contain or include water.

E. Conduct fastener pull tests prior to submittal submissions.

3.03 WOOD BLOCKING INSTALLATION

A. Wood blocking and nailers shall be installed using the approved roof membrane manufacturers stainless steel fasteners, or as otherwise required to comply with wind uplift resistance requirements. All blocking and nailers required to be anchored by bolts and/or screws shall be

counter bored to allow the top of the bolt or screw head to be flush with, or slightly below, the top of the finished wood surface. Provide all required expansion sleeves and other anchorages necessary and required for compliance with requirements of the Contract Documents.

1. Perform pull-out test to field verify integrity of fasteners

B. Wood blocking and nailers shall be provided in accordance with the approved roof membrane manufacturer's installation details, or as otherwise required to accommodate field conditions, approved by the Architect.

C. Provide non-pressure treated plywood at all locations where roof membrane is required to be directly adhered to the exposed wood surface. Coordinate areas to receive fully adhered membrane roofing to ensure the proper substrate material is used in accordance with the approved roof membrane manufacturer's written recommendations, and the Contract Documents.

D. Refer to the Drawings for all conditions necessary to complete the Work. In the absence of Drawing details, blocking shall be provided in accordance with the approved roof membrane manufacturer's written installation details, or as otherwise required to accommodate field conditions approved by the Architect.

E. Install plywood roof sheathing with the grain of the outer plies at right angles to supports. Stagger end joints and locate over the center lines of supports. Allow 1/8 in. spacing at panel ends and panel edges. Fasten panels to metal members with self-tapping screws and to wood members with wood screw nails spaced 6 in. on centers at bearings.

3.04 INSTALLATION OF AIR/VAPOR BARRIER MEMBRANE

A. Apply primer by roller at approximately 1.22 gals/sq for porous surfaces and 0.25-0.61 gal./sq for non-porous surfaces.

B. Apply vapor retarder the same day as primer.

C. Begin application at the bottom of the slope. Unroll vapor retarder onto the substrate without adhering for alignment. Overlap each preceding sheet by 3 in. lengthwise following the reference line by 6 in. at each end. Stagger end laps by at least 12 in. Do not immediately remove the release sheet.

D. After alignment, peel back a portion of the release sheet and press membrane onto the substrate for initial adherence. Hold vapor barrier and peel back release sheet by pulling diagonally.

E. Press vapor retarder down into the substrate as well as the laps using a 75 lb. roller. Finish by aligning the edge of the roller with the lower end of the side laps and rolling up the membrane. Do not cut membrane to remove air bubbles trapped under the laps. Squeeze out air bubbles by pushing the roller to the edge of the laps.

F. Apply uniform and continuous pressure to exposed edges and end laps to ensure complete adhesion.

G. Completely seal temporary roof at terminations, obstructions, and penetrations to prevent air movement into roofing system.

H. Seal all joints in air infiltration barrier and provide adhesives as recommended by the approved roof membrane manufacturer.

3.05 APPLICATION OF ROOF INSULATION

A. Verify all dimensions, drain heights, and drain locations in the field prior to installation of both flat and tapered insulation systems.

B. Starting at low points loose-lay flat directly over vapor retarder. Insulation panels shall be installed over the deck substrates in thickness as indicated on the Drawings. All insulation panels shall be butted snugly with no gaps greater than 1/4 inch. Gaps greater than 1/4 in. shall be filled with the same material.

1. Mechanically attach all layers of insulation including cover board to structural deck with roof membrane approved fasteners and plates at a rate approved and tested by the roof membrane manufacturer to meet uplift pressures as defined in Part 1 of this Section.

C. Install tapered insulation as shown on the Drawings

3.06 ROOF MEMBRANE INSTALLATION

A. Inspect insulation surfaces prior to membrane installation. Ensure surface is clean, dry, and smooth without excess surface roughness, contaminated or unsound surfaces, and debris.

B. Accurately align membrane roofing. Maintain uniform side and end laps of minimum dimensions required by manufacturer. Plan membrane layout to avoid side and end laps being placed over insulation plates. Stagger end laps.

C. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions.

D. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

E. Bareback Adhered Membrane Application

1. Apply adhesive using solvent-resistant 3/4 in. nap paint rollers. The adhesive shall be applied to the substrate at a rate according to the roofing manufacturer's requirements. Apply adhesive in a smooth, even coating without gaps, globs, puddles or similar inconsistencies. Only an area that can be completely covered in the same day's operations shall be coated with adhesive. The first layer of adhesive shall be allowed to dry completely prior to installing the membrane.
2. When the adhesive on the substrate is dry, unroll the roof membrane. Adjacent sheets shall be overlapped 3 inches. Once in place, one-half of the sheet's length shall be turned back and the underside shall be coated with adhesive at a rate of 1/2 gallon per 100 square feet. When the membrane adhesive has dried slightly to produce strings when touched with a dry finger, the coated membrane shall be rolled onto the previously coated substrate being careful to avoid wrinkles. Do not allow adhesive on the underside of the membrane to dry completely. The amount of membrane that can be coated with adhesive before rolling into substrate will be determined by ambient temperature, humidity, and crew. The bonded sheet shall be pressed firmly in place with a minimum 100 lb steel, membrane roller, by rolling in two directions.
3. The remaining un-bonded half of the sheet shall be folded back, and the procedure repeated.
4. The Applicator shall count the amount of pails of adhesive used per area per day to verify conformance to the specified adhesive rate.
5. Do not install when the air temperature is within 5° of dew point. Solvent evaporation time increases significantly when temperatures drop.
6. No adhesive shall be applied in seam areas. All membrane shall be applied in the same manner.

## 3.07 HOT-AIR WELDING OF SEAM LAPS

A. General

1. All seams shall be hot-air welded. Seam overlaps should be 3 in. wide when automatic machine-welding and 4 in. wide when hand-welding, except for certain details.
2. Weld coverstrips at all membrane seams that do not have a factory selvage edge such as butt joints and cut edges.
3. Welding equipment shall be provided by or approved by the membrane manufacturer. All mechanics intending to use the equipment shall have successfully completed a training course provided by Sika Sarnafil Technical Representative prior to welding. Ensure welding equipment is functioning properly prior to using
4. All membranes to be welded shall be clean and dry.

B. Hand-Welding
   1. Hand-welded seams shall be completed in two stages. Hot-air welding equipment shall be allowed to warm up for at least one minute prior to welding.
   2. The back edge of seam shall be welded with a narrow but continuous weld to prevent loss of hot air during final welding.
   3. Insert nozzle into seam at a 45° angle to edge of membrane. Once proper welding temperature has been reached and membrane begins to "flow," position hand roller perpendicular to nozzle and roll lightly. For straight seams, use 1-1/2 in. wide nozzle. For corners and compound connections, use a 3/4 in. wide nozzle.

C. Machine Welding
   1. Machine welded seams are achieved using approved automatic welding equipment. When using this equipment, the manufacturer’s instructions shall be followed and local codes for electric supply, grounding and over current protection observed. Dedicated circuit house power or a dedicated portable generator is recommended. No other equipment shall be operated off simultaneously the generator.
   2. Metal tracks may be used over the deck membrane and under the machine welder to minimize or eliminate wrinkles.

D. Quality Control of Welded Seams
   1. Applicators shall check all welded seams for continuity using a rounded screwdriver. Visible evidence that welding is proceeding correctly is smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of dark grey material from the underside of the top membrane.
   2. On-site evaluation of welded seams shall be made daily by the Applicator at locations directed by the Owner's Representative or manufacturer’s representative.
   3. 1 in. wide cross-section samples of welded seams shall be taken at least three times a day. Correct welds display failure from shearing of the membrane prior to separation of the weld.
   4. Each test cut shall be patched by the Applicator at no additional cost to the Owner.
   5. Apply roofing membrane with side laps shingled in such a manner that water runs over or parallel to lap. Do not allow roof membrane to “buck” water.

E. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
   2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.
   4. T-Joints (three-way overlaps): Wherever possible, the head lap shall extend under the field seam so that the T -joint patch only to step down over one thickness of membrane. When welding a T-joint, the top edge of the second membrane layer shall be chamfered to create a smooth transition for the top membrane layer to conform to positive welding. Chamfer the edge of the membrane using a hand-held chamfer tool supplied by the manufacturer. Provide T-joint patches for all T-joints.

F. Spread sealant over deck drain flange at roof drains and securely seal membrane in place with clamping ring.

3.10 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Prime plywood surfaces with bonding adhesive prior to installation of membrane adhesives.

C. Apply low VOC bonding adhesive to the preprimed substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

D. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

E. Clean splice areas, apply splicing cement (except for heat-welded application), and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

F. Terminate and seal top of sheet flashings.

3.11 LIQUID FLASHING INSTALLATION

A. Surface Preparation

1. Penetration should be secured. All surfaces should be clean, dry, free of dirt, dust, debris, loose particles, loose paint, rust, and other contaminants.
2. Clean new Sarnafil and Sikaplan roofing membranes with mineral spirits or all- purpose cleaner which will not remove the lacquer coating from the membrane. If the membrane is old or extremely soiled use roofing manufacturer’s seam cleaner to restore membrane to a “like new” condition before applying liquid flashing.
3. Clean and prepare metal surfaces to near white metal in accordance with SSPC-SP3 (power tool clean). If power tools are not available, use abrasive paper with a grain size of 20 to 40 to remove all loose particles including paint flakes and rust.
4. Grind concrete and masonry surfaces with diamond cup wheel to remove laitance and contaminants.
5. Lightly sand glass, rigid PVC, and plastic surfaces.
6. Extend surface preparation a minimum of 1/8 in. beyond the termination of the flashing.
7. Wipe metal and glass surfaces with roofing manufacturer’s seam cleaner and allow to dry.
8. Apply painters tape a minimum of 6 in. beyond the penetration to ‘picture frame’ and mask the outside edge of the detail.
9. Pre-cut fleece to fit around the penetration. Vertical flashing pieces must extend 2 in. onto roof membrane and 2 in. below finished flashing height. The finished flashing height should be a minimum of 8 in. above the roof where possible. Horizontal flashing pieces must extend 4 in. beyond the base of penetration.

B. Mixing

1. Thoroughly mix the entire container of liquid flashing according to manufacturer’s instructions.

C. Application

1. After mixing in catalyst, apply liquid flashing to a clean prepared surface using a small 1⁄2 in. nap roller with rounded edges.
2. Apply 55 mils of liquid flashing onto penetration up to finished flashing height and 4 in. onto the roof membrane. Embed the pre-cut vertical flashing liquid flashing fleece into the wet Liquid flashing. Use roller to eliminate wrinkles and air bubbles while completely saturating the fleece. Overlap adjoining pieces of fleece 2 in. minimum. Apply additional liquid flashing at overlap between the fleece layers.
3. Apply 55 mils of liquid flashing onto the roof membrane extending onto painter's tape. Embed pre-cut horizontal flashing fleece with smooth side facing up into wet liquid flashing.
4. Use roller to eliminate wrinkles and air bubbles while completely saturating fleece.
5. Overlap adjoining pieces of fleece minimum of 2 in. Apply additional liquid flashing at overlap between the fleece layers. Apply 25 mils of liquid flashing over entire penetration terminating at finished flashing height on the vertical and onto painter's tape on roof.
6. Ensure the fleece is fully saturated without any dry spots.
7. Remove painter's tape immediately after application.
8. Complex and irregular shapes such as nuts and bolts, may require an additional 25 mil thick application of liquid flashing to ensure full coverage. Wait one hour before applying an additional coat.

3.12 WALKWAY INSTALLATION

A. Prior to walkway installation check all existing deck membrane seams that are to be covered. Re-weld any inconsistencies before installation

B. Install walkway in locations indicated on Drawings. Install adhered walkway according to roofing system manufacturer's written instructions.

C. Install rooftop walkway grating with rubber feet according to manufacturer's instructions.

D. Do not install adhered walkway over membrane seams.

3.13 COMPLETION

A. The Contractor of this Section and the approved manufacturer shall submit warranties for approval prior to final payment.

3.14 RUBBISH REMOVAL

A. The Prime Contractor shall remove and dispose daily of all waste and debris in accordance with the requirements of Section 01 50 00 – Temporary Facilities and Controls.

**END OF SECTION**

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# SECTION 07 56 00

# FLUID-APPLIED ROOFING/WATERPROOFING

## PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 01 - General Requirements, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

A. The Work of this Section includes, but is not limited to, furnishing and installation of the following:
   1. New cold-applied polyurethane roofing/waterproofing system including, but not limited to, the following:
   2. Substrate preparation.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Specification Sections which directly relate to the Work of this Section include, but are not limited to, the following:
   1. DIVISION 01 – GENERAL REQUIREMENTS; including all Sections contained therein.
   2. DIVISION 02 – EXISTING CONDITIONS; including all Sections contained therein.
   3. Section 04 20 01 – Masonry Restoration
   4. DIVISION 05 – METALS; including all Sections contained therein.
   5. Section 06 10 00 - Rough Carpentry
   6. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
   7. Section 22 00 00 – Plumbing

1.04 QUALITY ASSURANCE

C. The roofing/waterproofing system shall be applied for by the Contractor for this Section shall have a minimum 10 years of experience who has been approved and authorized prior to bid, by the approved roof membrane manufacturer.

D. Upon completion of the installation, and at appropriate intervals during installation, an inspection shall be made by a representative of the manufacturer to ascertain that the roofing system has been installed according to applicable manufacturer's specifications and details.

1.05 PERFORMANCE REQUIREMENTS

A. Roofing/Waterproofing System Design: Provide a roofing/waterproofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7-16. Design Wind Speed: 134 mph. Refer to drawing S0.01.

1. Field-of-Roof Uplift Pressure: Refer to Drawing A2.00.
2. Perimeter Uplift Pressure: Refer to Drawing A2.00.
3. Corner Uplift Pressure: Refer to Drawing A2.00.

B. Installed roofing/waterproofing membrane system shall not permit the passage of water and will withstand the design pressures calculated in accordance with ASCE 7-16.

C. Manufacturers shall provide all primary roofing/waterproofing materials that are physically and chemically compatible when installed in accordance with manufacturers' current application requirements.

1.06 SUBMITTALS

A. Installer's Authorization: Installer shall provide written documentation from the manufacturer of their authorization to install the system, and eligibility to obtain the warranty specified in this section.

B. Samples and Shop Drawings:

1. Provide shop drawings to include, but not be limited to, the following:
   a. Outline of roofs and sizes, showing field, corners, and perimeters
   b. Insulation fastening pattern for fasteners and adhesives at field, corners, and perimeter
   c. Location and type of all penetrations
   d. Perimeter and penetration flashing details
   e. Warranty type and period
   f. Technical acceptance from membrane manufacturer

C. Manufacturer's Certification: Certification showing full time quality control of production facilities and that each batch of material is tested to ensure conformance with the manufacturer's published physical properties.

D. VOC Certification: Manufacturer's certification that all roofing/waterproofing system products meet current Volatile Organic Compound (VOC) regulations as established by the State in which they are being installed; and stating total VOC content, in grams per liter, for all system components (i.e., primers, adhesives, coatings, etc.).

E. Provide the manufacturer's most recent edition of material and performance specifications for all materials provided under the Work of this Section.

F. Provide three copies of the membrane manufacturer's full system warranty, and three (3) copies of the applicators' warranty.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

B. Handle all materials to avoid damage to materials and roof deck. Store rolled goods directed by manufacturer. Discard rolls which have been flattened, creased, or otherwise damaged. Bonding adhesive shall be stored at temperatures above 40°F.

C. All flammable materials shall be stored in a cool dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.

D. Do not allow materials or incomplete roofing Work to be exposed to moisture, anywhere, at any time, during transportation, storage, handling, or installation. Use pallets and tarpaulins to cover all stored material, top to bottom. Secure tarpaulin.

1.08 PROJECT CONDITIONS

A. Perform Work only when existing and forecasted weather conditions are within the limits established by manufacturers of the materials and products used.

B. Only as much of the new roofing as can be made weather-tight each day, including all flashing Work, shall be installed.

C. All Work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks.

D. The membrane manufacturer requires the owner's representative or Trade Contractor for this Section to run pullout tests of fasteners to verify the condition of deck/substrate and confirm pullout values.

E. All surfaces to receive new insulation, membrane or flashings shall be thoroughly dry. Should surface moisture occur, the Trade Contractor for this Section shall provide the necessary equipment to dry the surface prior to application.

F. Temporary water stops shall be installed at the end of each day’s Work and shall be removed before proceeding with the next day's Work. Waterstops shall be compatible with all materials and shall not emit dangerous or incompatible fumes. Provide waterstops for all roofing systems described in this specification per manufacturers recommendations.

G. The Trade Contractor for this Section shall provide all necessary protection and barriers to segregate the Work area and to prevent damage to adjacent areas. Plywood protection shall be provided for all new roofing areas which shall receive traffic during construction.

H. Prior to and during application, all dirt, debris, and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air and/or similar methods.

I. Membranes and accessories shall not be exposed to prolonged temperature excess of 160° F.

J. Contaminants, such as grease, fats, oils, and solvents, shall not be allowed to come into direct contact with the roofing membrane. Any unusual exposures shall be presented to the membrane manufacturer for assessment of any impact on the roofing membrane.

1.09 WARRANTY

A. Provide 30-year full roofing system warranty, no cap, non-prorated, transferable, labor and material, manufacturer’s warranty to the Owner by the approved roof membrane system manufacturer from date of Final Completion.

B. The Roofing Contractor, as a condition precedent to final payment, shall execute his own written guarantee direct to the Owner, warranting all roofing, base flashing, and sheet metal work to be weather and watertight for a period of two years after date of final completion on the Project. Any imperfections as a whole or in part, by reason of defective materials, workmanship, or arrangement of the various parts at the Trade Contractor's expense.

1.10 PRE-INSTALLATION MEETING

A. The Prime Contractor shall schedule a pre-installation meeting to establish compliance and expectation of Work, maintain optimum working conditions, determine acceptable mock-ups, and coordinate the Work of this Section with related and adjacent Work. The meeting shall be attended by the Prime Contractor, Owner's Project Manager, Architect, Roofing Subcontractors, and Manufacturer's Representatives.

## PART 2 - PRODUCTS

2.01 CONCRETE DECK PREPARATION

A. Overlay/patching primer shall be a 2-component, 100% solids, moisture-tolerant, epoxy resin binder conforming to current ASTM C-881, Type III, Grade-2, Class-C and AASHTO M-235 specifications. Basis of Design: Sikadur-22 Lo-Mod by Sika Corporation, Lyndhurst NJ.

B. Deck overlay/patching repair areas: ASTM C928, one-component, rapid hardening, early strength gain, cementitious, patching mortar for concrete. Thickness: ¼ in. minimum, 2 in. maximum. Basis of Design: SikaQuick-1000 by Sika Corporation, Lyndhurst NJ.

C. Primer for all concrete areas including overlay/patching areas: Single component, rapid curing, moisture cured primer. Basis of design: Sika Concrete Primer Lo-VOC.

2.02 ROOFING/WATERPROOFING SYSTEM

A. Base embedment coat shall be a single component, cold, fluid applied, moisture triggered, aliphatic, polyurethane base coat membrane.

1. Reinforcement: Non-woven needle punched polyester fleece weighing 5 oz./sq. yd. Basis of design: Sika Fleece-170.

B. Topcoat shall be a single component, cold, fluid applied, moisture triggered, aliphatic, polyurethane topcoat membrane

C. Basis-of-Design: Sikalastic RoofPro System manufactured by Sika Corporation, Lyndhurst NJ. composed of:

1. Base Layer: Sikalastic 641 Lo-VOC, 50 mils wet film thickness, 24 sf/gal coverage rate (approx.)
2. Sika Fleece-170. Non-woven needle punched polyester fleece weighing 5 oz./sq. yd.
3. Top Layer 1: Sikalastic 641 Lo-VOC, 23 mils wet film thickness, 69 sf/gal coverage rate (approx.)
4. Top Layer 2: Sikalastic 641 Lo-VOC, 23 mils wet film thickness; 69 sf/gal coverage rate (approx.)

D. Supplemental reinforcement of the roofing/waterproofing system specifically designed for local reinforcement of the waterproofing membrane at structural cracks, expansion joints and transitions between dissimilar materials shall be as recommended by roofing/waterproofing manufacturers.

2.03 ROOFING/WATERPROOFING ACCESSORIES

A. Sealants:

1. Fillet bead and membrane penetrations: ASTM C920 Type S, Grade NS, Class 12.5, Use NT, I, M, A, O; one-component, gun-grade, moisture-cured polyurethane with an accelerated curing that creates an adhesive and sealing compound of permanent elasticity. Basis of Design: Sikaflex-11FC by Sika Corporation, Lyndhurst NJ.
2. Exposed finish sealant: ASTM C 920, Type S, Grade NS, Class 50, Use NT, M, A, and O; high-performance, very low- modulus, high-movement, non-sag, fast-curing, hybrid sealant. capable of +100/-50% movement. Basis of Design: Sikaflex-HY 150 by Sika Corporation, Lyndhurst NJ.
3. Sealant for adhering roofing waterproofing system to red copper edge metal: Extended open time, toughened, low to medium modulus, structural methyl methacrylate (MMA) adhesive. Basis of Design: SikaFast-3341.

B. Reinforcement tape for parapet/wall flashings and control joints: Woven nylon mesh for reinforcing and detailing or self-adhering polymeric rubberized tape with woven polyester facers. Basis of design: Sika Flexitape or Sika Joint Tape SA.

## PART 3 - EXECUTION

3.01 GENERAL

A. The Work of this Section shall include coordination of the installation as necessary to ensure each area is made watertight at the end of each Work period.

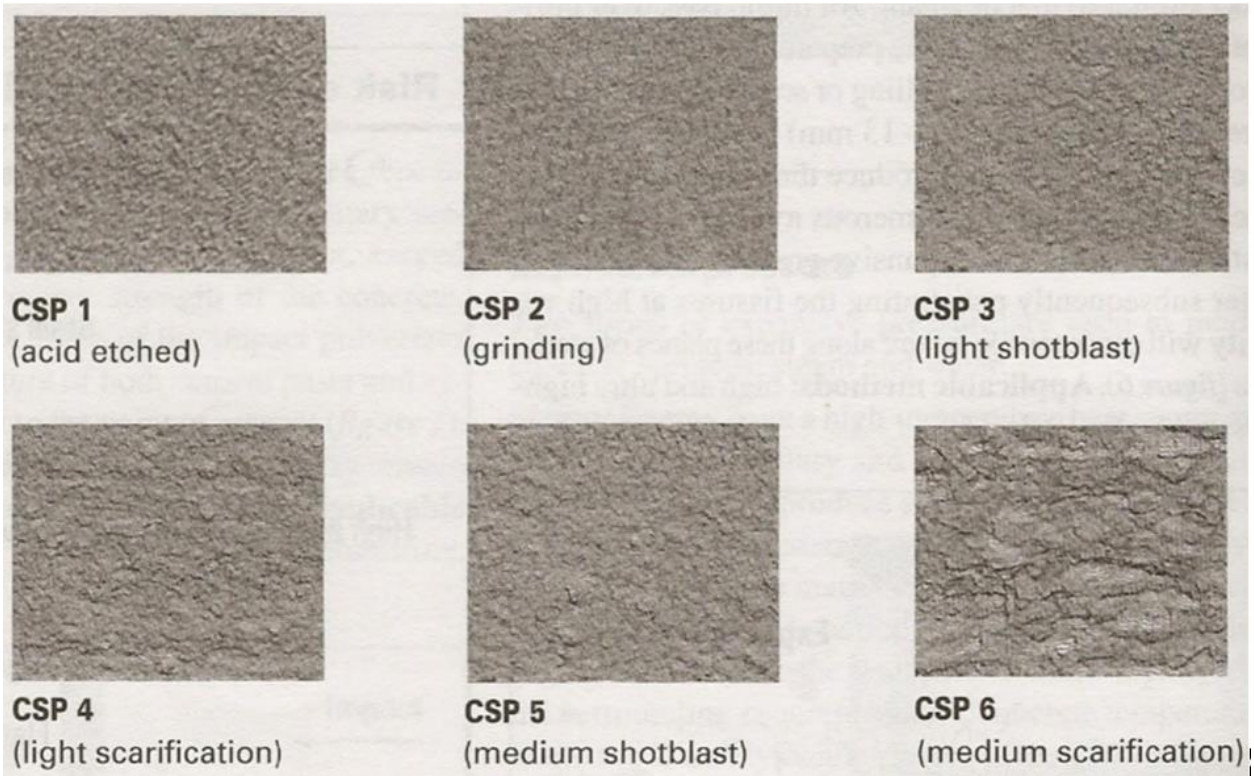
B. Verify that surfaces and conditions are ready to accept the Work of this section. Notify Architect in writing of any discrepancies. Commencement of the Work in an area shall indicate Installer's acceptance of the substrate.

C. Surfaces shall be sound, dry, clean, and free of oil, grease, dirt, excess mortar, or other contaminants. Fill voids, gaps, and spalled areas in substrate to provide an even plane. Strike masonry joints full flush.

3.02 SURFACE PREPARATION

A. Remove all existing pavers, EPDM membrane, and bituminous roofing to concrete deck.

B. Scarify/grind all bituminous contaminants from deck to achieve an open texture of CSP 2-4 according to ICRI guidelines:




C. Remove any loose debris, dirt, and dust.

D. Concrete shall be low-pressure washed (5,000 psi or less) according to ICRI Technical Guideline No. 310.2R-2013: Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays to remove all dirt, debris or surface contamination that would compromise bonding of the specified roofing/waterproofing membrane system. Remove oil or grease with solvents, or detergent and water. Rinse surface clean of remaining cleaning agents.

E. Prime entire area with two-component epoxy primer. Mix and apply specified primer for concrete/masonry/wood surfaces by brush or roller at the application rate shown on the technical data sheet. Porous, rough, or absorbent surfaces will decrease coverage rates. Allow to cure according to manufacturer's technical data sheets.

F. Repair spalled and aggregate exposed areas with one-component, rapid hardening, early strength gain, cementitious, patching mortar for concrete. Mix and apply according to manufacturer's instructions.

3.03 COLD FLUID APPLIED FIELD MEMBRANE APPLICATION

A. Install roofing/waterproofing membrane system in accordance with current technical data sheets and according to para. 2.02 of this Section.

B. Surface Priming
   1. Prime entire roof deck, wall and penetration flashings, and parapets with a cold applied, single component, moisture-curing polyurethane resin.
   2. Apply primer by medium nap phenolic core roller or squeegee and back roll ensuring an even and consistent coverage. Ensure all excess material is removed by back rolling with no pooling or puddling of resin.
   3. Allow primer to be cured until tack free before proceeding with subsequent system.
   4. Primer must be overcoated within 72 hours with cold-applied field membrane application. If 72 hours is missed, the primer must be abraded, and solvent wiped followed by an additional coat of primer before proceeding.

C. Apply base embedment coat to horizontal deck and vertical wall surfaces by brush or ½-inch nap roller to achieve a continuous and uniform minimum wet film thicknesses as specified in para. 2.02C of this section.

D. Immediately lay conformable reinforcement membrane into the wet base embedment coat. Precut reinforcement before application.

E. Apply pressure to the membrane reinforcement with roller to fully embed and saturate the membrane reinforcement into liquid roofing/waterproofing material. Remove air pockets from under the membrane by rolling them out.

F. Apply additional liquid material as required to ensure the membrane reinforcement is fully embedded and has conformed to the substrate without tenting, visible pinholes, air pockets, fish mouths or wrinkles.

G. Overlap sheets of membrane reinforcement a minimum of 3-inches along the sides and 6-inches at roll ends.

H. Extend membrane reinforcement vertically at adjacent wall surfaces in accordance with project details and specifications.

I. Apply Top Layer 1 coat by nap roller or brush to achieve a continuous and uniform minimum wet film thickness as specified in para. 2.02C of this Section.

J. Perform high voltage EFVM testing, breach repairs, and subsequent EFVM testing.

K. After all testing and repairs, apply Top Layer 2 by nap roller or brush to achieve a continuous and uniform minimum wet film thickness as specified in para. 2.02C of this Section.

L. Allow a base coat and each additional coat to dry overnight.

M. Install all flashings in accordance with manufacturer's and/or project specific construction details.

3.04 PARAPET/WALL FLASHINGS AND CONTROL JOINTS

A. Clean, prepare and prime flashing substrate surfaces ready to receive membrane flashing applications.

B. All parapet, wall, and curb flashings shall be provided with a cant bead of sealant with Sika SA Tape reinforcement prior to fleece flashing application.

C. Terminate roofing/waterproofing membrane system at raked-out mortar joints, termination saw cut joint, or under installed counter-flashing materials. Seal all mortar joints and saw cut joints with specified sealant.

D. Install metal counter flashings in accordance with details.

3.05 DRIP EDGES AND OTHER METAL FLANGED FLASHING

A. Clean, prepare and prime metal flange surfaces ready to receive flashing application.

3.06 ROOF DRAINS

A. Clean, prepare and prime surfaces ready to receive membrane applications. Block drain bowl opening to avoid roofing/waterproofing material from entering the drainage system.

B. Extend the liquid roofing/ waterproofing material and membrane reinforcement directly into the bowl of the prepared drain.

C. Remove drain blocks and allow the roofing/waterproofing system to fully cure dry prior to re-connecting the drain bowl assembly.

3.07 ROOF PENETRATIONS

A. Clean, prepare and prime surfaces ready to receive membrane flashing applications. Ensure that penetration is secured to prevent movement.

B. Penetration flashings typically consist of two components. A vertical flashing component extends up the penetration and is torn at bottom so that it can be extended horizontally onto the deck/substrate. A horizontal flashing component covers all tears and extends vertically up the penetration. The intent is to achieve a 2-3-inch overlap of the two flashing components.

3.08 ELECTRIC FIELD VECTORING MAPPING

A. Conduct Electric field vector mapping (EFVM) according to ASTM D7877 for deck field and flashings.

B. Testing agency contracted by roofing/waterproofing contractor to survey entire waterproofing area for potential leaks using EFVM high voltage system.

C. Repair and retest waterproofing system, report all deficiencies to the Architect.

3.09 DECK PROTECTION

A. Protect roofing/waterproofing work from other trades until completion.

B. Stage materials in such a manner that avoids foot traffic over completed areas.

3.10 CLEAN-UP

A. Work areas are to be kept clean, clear, and free of debris always.

B. Do not allow trash, waste, and/or debris to collect on roof deck. Trash, waste, and/or debris shall be removed daily from the roof deck.

C. All tools and unused materials shall be collected at the end of each workday and stored properly off finished surface and protected from exposure to the elements.

D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.

E. Clean and restore all damaged surfaces to their original condition.

3.11 RUBBISH REMOVAL

A. The Prime Contractor shall remove and dispose daily of all waste and debris in accordance with the requirements of Section 01 50 00 – Temporary Facilities and Controls.

**END OF SECTION**

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# SECTION 07 62 00

# SHEET METAL FLASHING AND TRIM

## PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 01 - General Requirements, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

A. The Work of this Section shall include, but not be limited to, furnishing and installation of the following:
   1. Formed metal coping and flashings
   2. Formed copper cladding
   3. Pressure treated and non-pressure treated wood blocking and plywood sheathing, including all fasteners.
   4. All receivers, clips, cleats, and trim required for a complete installation

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Specification Sections which directly relate to the Work of this Section include, but are not limited to, the following:
   1. DIVISION 01 – GENERAL REQUIREMENTS; including all Sections contained therein.
   2. Section 02 41 13_Selective Demolition
   3. Section 03 30 00_Cast-In-Place Concrete. See Structural Drawings
   4. Section 04 20 01_Masonry Restoration
   5. DIVISION 05 – METALS; including all Sections contained therein.
   6. Section 06 10 00_Rough Carpentry
   7. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
   8. Section 22 00 00_Plumbing

1.04 SUBMITTALS

A. Provide submittals in accordance with requirements of Section 01 33 00 – Submittal Procedures, and in accordance with requirements of the Contract Documents.

B. Submit manufacturer’s product data for each product indicated

C. Submit large scale shop drawings, including layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing and trim

D. Submit 12 in. square, or 12 in. long samples for each type of sheet metal flashing and trim.

1.05 QUALITY ASSURANCE

A. The Work of this Section shall comply with the requirements of SMACNA's "Architectural Sheet Metal Manual" and conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. The roof edge fascia system shall comply with the requirements of ANSI/SPRI ES-1 Wind Design Standard.

C. Intake vented fascia system at eave must be designed to meet or exceed the required net free area per linear foot (nfa/lf) required to provide 100 percent airflow into vented nailbase system airspace.

1.06 PRE-INSTALLATION MEETING

A. The General Contractor shall schedule a pre-installation meeting to establish compliance and expectation of Work, maintain optimum working conditions, determine acceptable mock-ups, and coordinate the Work of this Section with related and adjacent Work. The meeting shall be attended by the General Contractor, Owner's Project Manager, Architect, and related subcontractors.

**PART 2 - PRODUCTS**

2.01 SHEET METAL FLASHINGS AND COPINGS

A. Valley flashing, step-flashing, cap flashing, copings, and counterflashing shall be copper: ASTM B370; temper H00 (cold-rolled) except where temper 060 is required for forming;
   1. 16 oz. per sq. ft. (0.0216-inch thick) (0.55 mm) except as otherwise indicated.
   2. Fasteners for step flashing, counterflashing, copings, cap flashing, and related accessories shall be the same metal as flashing/sheet metal or Type 304 stainless steel in sizes and configurations as indicated on the Drawings or as required by roof system components' manufacturers.

2.02 PRESSURE TREATED WOOD

A. Provide pressure treated wood blocking and sheathing that is pressure treated to a level of 0.25 pounds per cubic foot of wood product, with waterborne CCA preservatives in accordance with requirements of AWPA Standard U1 and T1. Pressure treated lumber shall be dried to a maximum moisture content of 15 percent after treatment.
   1. Provide non-pressure treated lumber at all locations where roof membrane and adhesive flashings are required to be directly adhered to the lumber surface.

B. Provide APA trademarked, Exposure 1 Rated and non-rated plywood performance rated sheathing, 3/4 in. thick, with span rating for spans indicated. Use of particleboard, flakeboard, or oriented strand board (OSB), shall not be allowed. Sheathing shall be pressure treated to a level of 0.25 pounds per cubic foot of wood product, with waterborne CCA preservatives in accordance with requirements of AWPA Standard U1 and T1.
   1. Provide non-pressure treated plywood at all locations where roof membrane and adhesive flashings are required to be directly adhered to the plywood surface.

C. Wood blocking and nailers shall be in profiles and sizes as indicated or required by the approved roof membrane manufacturer. Blocking and nailers shall be installed at the perimeter of the entire roof and around all other roof projections and penetrations. Thickness of blocking and nailers shall be fabricated to provide a smooth transition from blocking to adjacent insulation.

D. Provide fasteners with G-90 hot dip galvanized coating, or fluoroploymer coating, at areas of high humidity, including roof blocking and sheathing. Fasteners for use with non-CCA pressure treated lumber, including ACQ Types B and D, CBA-A, and CA-B, shall be stainless steel.

2.03 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, flux, welding rods, protective coatings, separators, sealants, and other miscellaneous items required for complete sheet metal flashing and trim installation.

B. Fasteners, including wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners shall be designed and installed to withstand specified design loads.

C. Butyl sealant shall comply with requirements of ASTM C 1311 for single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

D. Bituminous coating shall be cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat.

2.04 FABRICATION, GENERAL

A. Custom fabricates sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. The shop fabricates items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

C. Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

D. Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, and in thickness not less than that of metal being secured.

## PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items necessary and required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.
2. Saw cut existing masonry a minimum of 1 inch in depth or as otherwise required for installation of new base flashing and counter flashing.
3. Install the new counter flashing in a continuous manner, anchored with lead wedges at 8 inches on center, minimum, overlapped and sealed in accordance with the Contract Documents.

B. Where dissimilar metals shall contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and butyl sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
2. Extruded termination base plate shall be set in a full bed of sealant in accordance with requirements of Section 07 54 19 – Polyvinyl-Chloride (PVC) Roofing.

F. Seal joints with butyl sealant in a professional workmanlike manner to produce a clean, tight watertight construction.

G. Clean surfaces to be soldered, removing oils and foreign matter. Pre-tinned edges of sheets to be soldered to a width of 1-1/2 inches except where pre-tinned surface would show in finished Work. Pre-tinning is not required for lead-coated copper.

H. Provide non-pressure treated blocking and plywood at all locations in accordance with the approved manufacturers' written requirements.

I. Refer to the Drawings for all conditions necessary to complete the Work. In the absence of drawing details, blocking and sheathing shall be provided in accordance with the approved flashing or pre-manufactured manufacturer's written installation details, or as otherwise required to accommodate field conditions approved by the Architect.

3.02 RUBBISH REMOVAL

A. The General Contractor shall remove and dispose daily of all waste and debris in accordance with the requirements of Section 01 50 00 – Temporary Facilities and Controls.

**END OF SECTION**

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# SECTION 07 72 00

# ROOF ACCESSORIES

## PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 01 - General Requirements, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

A. The Work of this Section includes, but is not limited to, furnishing and installation of the following:

1. Roof hatch
2. Access ladders
3. Warning line stands
4. Adhesive wall anchors
5. Welded tieback roof anchor
6. Capstone anchor pin
7. Precast concrete splash blocks
8. Roof drain maintenance markers
9. Fasteners and other anchorage devices for installation and attachment of wood blocking and sheathing provided under the Work of other Sections.
10. Pressure treated, non-pressure treated blocking, and plywood sheathing, including all fasteners.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Specification Sections which directly relate to the Work of this Section include, but are not limited to, the following:

1. DIVISION 01 – GENERAL REQUIREMENTS; including all Sections contained therein.
2. Section 02 41 13_Selective Demolition
3. Section 03 30 00_Cast-In-Place Concrete. See Structural Drawings
4. Section 04 20 01_Masonry Restoration
5. DIVISION 05 – METALS; including all Sections contained therein.
6. Section 06 10 00_Rough Carpentry
7. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
8. Section 22 00 00 – Plumbing

1.04 QUALITY ASSURANCE

A. For each type of product required for the Work of this Section, provide products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary products.

1. Provide combination louvers and shut-off dampers whose performance ratings have been determined in compliance with the Air Movement and Control Association Standard 500 and which bear the AMCA Certified Ratings Seal.

B. Fire-Resistance and Performance: Provide heat and smoke vent units that have been tested, listed and labeled by UL or another agency acceptable to authorities having jurisdiction. Provide UL class A lids for all roof accessories.

C. Comply with applicable recommendations and details of SMACNA Architectural Sheet Metal Manual and NRCA Roofing and Waterproofing Manual. The Work of this Section shall include submission of written documentation that anchoring of all roof accessories complies with requirements of FEMA Advisory for Attachment of Rooftop Equipment in High Wind Regions dated July 2006, and load calculations in accordance with ASHRAE Journal, Volume 48, Number 3, March 2006 for Calculating Wind Loads and Anchorage Requirements for Rooftop Equipment,

D. Provide units designed to withstand 20 psf internal loading and 40 psf external loading.

E. Combination louvers and air shut-off dampers shall comply with requirements of 780 CMR, Chapter 13, Section 1304.3.7 Airtight Dampers.

1.05 SUBMITTALS

A. Provide submittals in accordance with requirements of Section 01 33 00 – Submittal Procedures, and in accordance with requirements of the Contract Documents.

B. Submit manufacturer's product data, including but not limited to, installation instructions, use limitations and recommendations for each material used, and certifications demonstrating materials comply with requirements.

C. Submit two representative samples of each material that is to be exposed in the finished Work, showing the full range of color and finish variations expected. Samples shall have a minimum area of 144 square inches.

D. Provide large scale shop drawings showing installation, anchorage and interface of the Work of this Section with the Work of adjacent trades.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle material in accordance with the approved manufacturer’s written requirements to protect them from damage.

1.07 PRE-INSTALLATION MEETING

A. The General Contractor shall schedule a pre-installation meeting to establish compliance and expectation of Work, maintain optimum working conditions, determine acceptable mock-ups, and coordinate the Work of this Section with related and adjacent Work. The meeting shall be attended by the General Contractor, Owner’s Project Manager, Architect, and related subcontractors.

## PART 2 - PRODUCTS

2.01 ROOF HATCH

A. Provide 30 in. x 54 in. single leaf roof hatch, NB-50TB as manufactured by Bilco or equal by Babcock-Davis or WB Doors. The roof hatch shall comply with the following properties:

1. The cover and curb shall be thermally broken to prevent heat transfer between interior and exterior surfaces.
2. Cover shall be reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
3. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
4. Operation of the cover shall not be affected by temperature.
5. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.

B. Cover: Shall be 11-gauge aluminum with a 5 in. beaded flange with formed reinforcing members. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. The cover shall have a heavy extruded EPDM rubber gasket bonded to the cover interior to ensure a continuous seal when compressed to the top surface of the curb.

C. Cover insulation: Shall be 3 in. thick polyisocyanurate with an R-value = 20.3 (U=0.279 W/m2K), fully covered and protected by an 18-gauge aluminum liner.

D. Curb: Shall be 12 in. in height and of 11-gauge aluminum. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. The curb shall be formed with a 5-1/2 in. flange with 7/16 in. holes provided for securing the roof deck. The curb shall be equipped with an integral metal cap flashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6 in. (153mm) on center, to be bent inward to hold single ply roofing membrane securely in place.

E. Curb insulation: Shall be 3 in. thick polyisocyanurate with an R-value = 20.3 (U=0.279 W/m2K).

F. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.

G. Hardware:

1. Heavy stainless steel pintle hinges shall be provided
2. The cover shall be equipped with a spring latch with interior and exterior turn handles
3. Roof hatch shall be equipped with interior and exterior padlock hasps.
4. The latch strike shall be a stamped component bolted to the curb assembly.
5. The cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1 in. (25mm) diameter red vinyl grip handle to permit easy release for closing.
6. All hardware shall be Type 316 stainless steel hardware].
7. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

H. Finishes: Factory finish shall be mill finish aluminum.

I. Safety Railing: Include roof hatch safety railing system accessory Bil-Guard 2.0 or equal.

2.02 ACCESS LADDERS

A. Provide tubular rail high parapet access ladder with platform and return at exterior locations, Model 503 as manufactured by O'Keeffe's or equal by FS Industries or Alaco Ladder.

B. Provide standard duty channel rail fixed access ladders at roof hatch locations, Model 500 as manufactured by O'Keeffe's or equal by FS Industries or Alaco Ladder.

C. The ladders shall comply with the following properties:
1. Aluminum Sheet: Alloy 5005-H34 to comply with ASTM B209.
2. Aluminum Extrusions: Alloy 6063-T6 to comply with ASTM B221.
3. Finish shall be mill as extruded.

D. Fabrication:
1. Rungs: Not less than 1-1/4 in. in section and 18–3/8 in. long, formed from tubular aluminum extrusions. Squared and deeply serrated on all sides.
   a. Rungs shall withstand a 1,500 lbs. load without deformation or failure.
2. Channel Side Rails: Not less than 1/8 in. wall thickness by 3 in. wide.
3. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8 in. wall thickness by 3 in. wide. Construction shall be self-locking stainless-steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.
4. Walk-Through Rail and Roof Rail Extension: Not less than 3 feet 6 inches above the landing and shall be fitted with deeply serrated, square, tubular grab rails.
5. Landing Platform: 1-1/2 in. or greater diameter, tubular aluminum guardrails and decks of serrated aluminum treads.
6. Security Doors: Formed 1/8 in. thick aluminum sheet. Security panels shall extend on both sides, perpendicular to the door face, to within 2 inches (51 mm) of the wall. Security door shall be furnished with continuous aluminum piano hinge and heavy-duty forged steel locking hasps.
7. Ship Ladder Seismic Bottom Support: Manufacturer's standard; two isolation bearings per stringer.
8. Ladder Safety Post: Retractable hand hold and tie off. Bilco Ladderup Safety Post or equal.
9. Rail and Harness Fall Arrest System: Supplied where specified as alternative to safety cage and landing platforms, in accordance with OSHA regulation 1910.27; permanently mounted to ladder rungs and complete with necessary components.

2.03 WARNING LINE STANDS

A. Provide a permanent warning line with heavy weighted based as manufactured by Leading Edge Safety or equal by Garlock Safety Systems or Safety Rail Source. The warning line shall consist of heavy weighted bases, steel cables, and warning flags to provide visibility. The warning line shall meet and exceed OSHA Standard CFR 29 1926.502(f) and 1910.29 for warning line systems.

B. Components:

| | | |
|---|---|---|
| 1. | Uprights: | Steel tube, 1.625 in. diameter x 0.065 in. wall. |
| 2. | Length: | 42 in. |
| 3. | Bases: | Steel plate. 23 x 23 in. |
| 4. | Thickness: | 1 in. |
| 5. | Nylon Coated Galv. Steel Cable: | 5/32 inch; 7x19. |
| 6. | Warning Flags: | 4 x 6 inches triangular shape aluminum with folding tabs. |
| 7. | Finish: | Powder coated steel. |
| 8. | Colors: | Safety Yellow and colors to match Kynar sheet metal, building components and RAL colors. |
| 9. | Hardware: | Stainless steel clamps. |
| 10. | Labels: | Applicable safety warnings and manufacturer's contact information. |
| 11. | Weight: | 99.6 lbs. |

2.04 WELDED TIEBACK ROOF ANCHORS

A. Provide welded tieback roof anchors, PBE75 as manufactured by Pro-Bel or equal by Kee Safety, Inc. or Industrial Safety Products. See detail 11/A2.07. The roof anchor shall comply with the following properties:

1. Standards Compliance:
   a. ANSI/AISC 360-16 "Specification for Structural Steel Buildings."
   b. AISC Manual of Steel Construction (14th Edition).
   c. AISC Design Guide 1, 2nd Edition - Base Plate and Anchor Rod Design.
   d. ANSI Z359.6 "Design of Active Fall Protection."
   e. OSHA 1910.140 (d).
   f. IBC 2018.
   g. ASCE 7-16.
   h. IWCA I-14.1-2001 "Window Cleaning Safety."
2. Each installation shall be approved by a qualified engineer to local standards and regulations.
3. Horizontal Load and Reaction Any Direction: 5,000 lbs.
4. Moment Reaction: 125,000 in-lbs.
5. Post Height: 20 - 30 inches. Coordinate the final height of each anchor with insulation thickness at each location. Minimum roof membrane flashing height on the anchor post shall be 8” above roof surface.
6. Diameter: 3-1/2” Maximum per Structural drawings.
7. Materials:
   a. All fabrication shall be performed in compliance with the AWS Code by AWS Certified Welders.
   b. Steel material shall conform to the following unless noted otherwise:
      1) Hollow Structural Sections: ASTM A500 grade C, min yield strength 46 ksi.
      2) Plates: ASTM A572 Grade 50, min yield strength 50 ksi.
      3) Top attachment point:
         a) Stainless steel u-bar: ASTM A276 Type 304 Condition A Cold Finished, min yield strength 70 ksi.

4) Tapped hole:
   b) Bolts: DIN EN ISO 3506-1:2009: Designation A4-70.
   c) Nuts: DIN EN ISO 3506-2 :2009: Designation A4-70.
   d) Washers: DIN EN ISO 3506-2 :2009: Designation A4-70.
5) Base connection to existing structure:
   a) Threaded rods: ASTM A193 Grade B7.
   b) Nuts: ASTM A194 Grade 2H.
   c) Washers: ASTM F436.

c. Paint and Coatings: All anchor components (excluding fasteners) shall be hot dipped galvanized in accordance with ASTM A123.

d. Horizontal Lifeline: Provide stainless steel cable and accessories to create continuous non-hands free (double lanyard) horizontal lifeline systems as indicated on the drawings, including but not limited to: 7x19 – 5/16" Aircraft Cable, turnbuckles, thimbles, fist grips, corner rollers, shock absorbers.

2.05 ADHESIVE WALL ANCHOR

A. Provide heavy-duty stainless steel base plate, four adhesive studs, and u-bar wall anchors PB48S-2S-BFI as manufactured by Pro-Bel or equal. The wall anchor shall have a working load of 1,000 lbs. in any direction. Anchor must be designed to ensure that fracture or detachment does not occur with a 5,000 lb. (22.2 KN) load. All adhesives must be load tested. See detail 11/A2.08.2. Include 1-piece inverted box flashing of 16 oz. copper.

2.06 PRE-CAST CONCRETE SPLASH BLOCK

A. Provide 18 in. x 36 in. x 4 in., 150 lbs., 4,000 to 6,000 psi, steel reinforced, pre-cast concrete splash blocks as manufactured by Phoenix Precast Products or equal by Modern Pre-Cast.

2.07 ROOF DRAIN MAINTENANCE MARKER

A. Roof Drain Marker: Drain dome-mounted vertical fiberglass flag marker secured in aluminum socket in turn secured with pre-punched aluminum bracket configured for through-bolting to roof drain dome. Provide one maintenance marker for each roof drain.

B. Basis-of-Design Product: Provide roof drain markers manufactured by Roof Drain Marker Co., LLC., West Bridgewater, MA; (877) 571-6644.

C. Marker: Pultruded fiber-reinforced polymer rod, 1/2 in. diameter x 48 in. long, with reflective dual-colored reversible ends enabling marking of selected drains.
   1. Flexural Strength, min.: 700,000 psi. (ASTM D 790).
   2. Impact Strength, min.: 40 ft-lb/in. (ASTM D 256).

D. Marker Base: ASTM B 209 extruded aluminum bar, 1 x 1 x 4 in. with milled flag receiver, threaded flag set screw retainer, and threaded base.

E. Flag Bracket: ASTM B 221, aluminum plate bracket, 1 x 11 x 0.063 in.

F. Fasteners:
   1. Bolts: ASTM F 593, stainless steel Alloy Group 2 (A4).
   2. Nuts: ASTM F 594, stainless steel Alloy Group 2 (A4).

2.10 FABRICATION

A. Fabricate Work to be straight, plumb, level, and square. Where roof slope exceeds 1/4 in. per foot, provide units with tapered bases to keep top of unit level.

B. Provide Work to sizes, shapes, and profiles indicated on approved shop drawings.

C. Make Work with uniform, weather tight joints.

2.11 FINISHES

A. Steel curb units: Provide minimum 2.0 mil dry film thickness of rust-inhibiting primer which is compatible with finish paint specified in Finish Painting Section 09900. Acceptable alkyd products include:

1. Benjamin Moore, Iron-Clad Retardo No. 163
2. PPG, Inhibitive Metal Primer
3. Rust-Oleum, Bare Metal Primer

B. Aluminum Components: Elevator vent louvers and framing shall receive a minimum 1.2 mil dry film thickness of thermo-cured fluorocarbon coating containing minimum 70 percent Kynar 500 resin over substrate which has been prepared by inhibited chemical cleaning, conversion coating, and priming in compliance with coating manufacturer's instructions and recommendations. Color shall be selected by Architect from manufacturer’s standard and premium color ranges.

C. Accessories:

1. 9 mil. polyethylene film tape with a heavy-duty synthetic rubber adhesive by Eagle Industries or equal.
2. High performance, wide web spray adhesive glue by Eagle Industries or equal.

**PART 3 - EXECUTION**

3.01 INSPECTION

A. The Installer shall examine substrates, supports, and conditions under which this Work is to be performed and notify the General Contractor, in writing, of conditions detrimental to the proper completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected. Beginning Work means Installer accepts substrates and conditions.

3.02 ROOF HATCH INSTALLATION

A. Install products in strict accordance with manufacturer’s instructions and approved submittals. Locate units’ level, plumb, and in proper alignment with adjacent work.

1. Test units for proper function and adjust until proper operation is achieved.
2. Repair finishes damaged during installation.
3. Restore finishes so no evidence remains of corrective work.

3.03 WARNING LINE STAND INSTALLATION

A. Install in accordance with manufacturer's instructions including the following.

B. Weighted bases and uprights shall be placed around the perimeter of the roof at required distances or other areas requiring controlled work zones. Steel cables shall be connected to the upright using quick-connect tabs. Aluminum flags with folding tabs shall be placed at required intervals.

3.04 WOOD BLOCKING INSTALLATION

A. Wood blocking and nailers shall be installed using the approved roof accessory manufacturers stainless steel fasteners, or as otherwise required to comply with wind uplift resistance requirements. All blocking and nailers required to be anchored by bolts and/or screws shall be sufficiently counter bored to allow the top of the bolt or screw head to be flush with, or slightly below, the top of the finished wood surface. Provide all required expansion sleeves and other anchorages required to comply with requirements of the Contract Documents.

1. Fasteners and other related anchorage devices for wood blocking and sheathing shall be as provided under the Work of Section 07 54 19 – Polyvinyl-Chloride (PVC) Roofing.

B. Wood blocking and nailers shall be provided in accordance with the approved roof accessories manufacturers installation details, or as otherwise required to accommodate field conditions approved by the Architect.

3.05 INSTALLATION

A. Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section.

B. Coordinate roof accessory installation with roof deck and roof system installations to form a weathertight building. Securely anchor accessories to structure.

C. To prevent corrosion, isolate dissimilar materials with isolation coating. Make sure that coating is compatible with the membrane roofing system used.

D. Set units with flanges in full bed of sealant.

E. Provide counterflashing or cap flashing as an integral part of roof accessory. Install overlap roof flashing specified in roofing Section.

F. Ships Ladder Installation

1. Install according to manufacturer’s instructions and at locations indicated on Drawings.

G. Roof Drain Marker Installation

1. Install roof drain markers on each roof drain dome in roof area indicated according to manufacturer's instructions.
2. Attach bracket to drain dome using manufacturer-furnished corrosion-resistant fasteners. Tighten securely.
3. Thread marker base to threaded stud on marker bracket and tighten securely.
4. Insert marker into marker base and secure using set screw. Coordinate selection of colored marker end based upon drain condition.

3.06 ADJUSTING AND CLEANING

A. Adjust any operating parts to Work easily, smoothly, and correctly. Lubricate as necessary.

B. The touch-up damaged coatings and to finish eliminating evidence of repair.

C. Repair minor damage to eliminate all evidence of repair. Remove and replace Work which cannot be satisfactorily repaired.

3.07 RUBBISH REMOVAL

A. The General Contractor shall remove and dispose daily of all waste and debris in accordance with the requirements of Section 01 50 00 – Temporary Facilities and Controls.

**END OF SECTION**

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# SECTION 07 92 00

# JOINT SEALANTS

## PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. All the Contract Documents, including Drawings, General Conditions, Supplementary Conditions, and all Sections of Division 01 - General Requirements, apply to the Work of this Section.

1.02 DESCRIPTION OF WORK

A. The Work of this Section includes, but is not limited to, furnishing and installation of the following:
   1. Joint fillers and sealers, including preparation, filling, sealing, and curing of joints at all exterior and interior locations, and dissimilar materials, as described in Part 3 – Execution of this Section.
   2. Exterior and interior sealant
   3. Insulating foam sealant
   4. Protection of completed Work.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Specification Sections which directly relate to the Work of this Section include, but are not limited to, the following:
   1. DIVISION 01 – GENERAL REQUIREMENTS; including all Sections contained therein.
   2. Section 02 41 13_Selective Demolition
   3. Section 03 30 00_Cast-In-Place Concrete. See Structural Drawings
   4. Section 04 20 01_Masonry Restoration
   5. DIVISION 05 – METALS; including all Sections contained therein.
   6. Section 06 10 00_Rough Carpentry
   7. DIVISION 07 – THERMAL AND MOISTURE PROTECTION; including all Sections contained therein.
   8. Section 22 00 00 - Plumbing

1.04 QUALITY ASSURANCE

A. The Work of this Section shall be performed by manufacturer approved applicators having a minimum of five (5) years application experience with the required materials.

B. For each type of material required for the Work of this Section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.

C. Make all arrangements and payments necessary to have the approved manufacturer's authorized representative on-site at beginning of waterproofing to advise installer and to ensure compliance with manufacturer's requirements.

D. Provide materials suitable for the intended use and compatible with the materials with which they shall be in contact. Compatibility of sealants and accessories shall be verified in writing by the approved manufacturer.

E. Provide products and materials tested and certified for low emissions of volatile organic compounds (VOC), in accordance with requirements of the Contract Documents. Refer to Section 01 81 13 - Low-Emitting Material Requirements for testing and certification to comply with the following:

1. All adhesives and sealants shall meet the VOC content requirements in the applicable category of South Coast Air Quality Management District (SCAQMD) Rule 1168, Adhesive and Sealant Applications (amended January 2005, or current version).

1.05 SUBMITTALS

A. Provide submittals in accordance with requirements of Section 01 33 00 – Submittal Procedures and in accordance with requirements of the Contract Documents.

B. Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material and system required by the Work this Section.

1. Prior to ordering waterproofing materials, the Waterproofing Subcontractor shall submit the items listed below to the Architect for approval:
   a. 3 copies of manufacturer's specifications for proposed products and installation instructions.
   b. Written approval of manufacturers use of the products in the proposed system.
   c. Specimens copy of membrane manufacturer's warranty.
   d. Dimensioned shop drawings indicating areas of Work, membrane layout and profile details of flashing methods for penetrations and terminations. It shall be the manufacturer's responsibility to verify compatibility with surrounding materials, especially at interface with other types of waterproofing.

C. Provide samples as follows:

1. Submit representative samples of each control joint, sealant and expansion joint specified herein, showing the full range of color and finish variations expected. Provide actual samples having a minimum length of 6 inches.
2. Provide samples of each waterproofing material to be used in the systems described herein, including primers, mastics, tapes, liquid waterproofing, termination bars and fasteners, protection, and drainage composite boards.

D. Provide certifications as follows:

1. Provide manufacturer's certification of sealant and joint material performance, including compatibility with adjacent materials to which material shall be applied. Provide certified test reports on aged performances, hardness, stain resistance, adhesion, cohesion and tensile strength, low temperature flexibility, elongation, modules of elasticity, water absorption, and the resistance to weight loss and deterioration due to heat, ozone, and ultraviolet exposure.

1.06 TESTS

A. Submit samples of every material to be used in the Work including, but not limited to, glass, gaskets, glazing materials, framing members, and all other components such as precast concrete, brick, concrete block and other adjoining materials, and accessories, to glazing sealant manufacturer to verify sealant compatibility and to determine, by testing in accordance with requirements of ASTM C794, if primers and what type of primers are required to ensure adhesion to substrates.

1. Submit at least 6 pieces of each type, class, kind, condition, and form of glass including monolithic, laminated, coated, and insulated glass for adhesion testing. Provide 6 pieces of each type of brick, precast concrete, concrete block, and other adjoining materials for adhesion and staining testing.
2. Schedule sufficient time for testing, analysis, and reporting of results, understanding that long lead times are required by the sealant manufacturer.
3. Obtain manufacturer's written report and recommendations regarding proper sealant choice and use. Use sealants and substrates only in combinations for which favorable adhesion and compatibility results have been obtained.
4. Make all arrangements and pay all expenses related to these tests.

B. Periodically test sealants in place for adhesion using methods recommended by sealant manufacturer. Promptly replace all sealant which does not adhere, or which fails to cure properly.

C. If manufacturers cannot or shall not perform these tests, employ at the expense of the Waterproofing Subcontractor an independent testing agency acceptable to the Architect to perform tests and certifications indicated.

1.07 MOCK-UPS

A. Provide Mock-ups before beginning Work of this Section at location acceptable to Architect and obtain Architect's acceptance of visual qualities. Protect and maintain acceptable mock-ups throughout the Work of this Section to serve as criteria for acceptance of this Work. Acceptable mock-ups may be incorporated into the finish Work. Mock-ups shall be as follows:

1. 10 Linear feet of each type of sealant, crack and joint control material specified.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products to the job site in original, unopened package, clearly labeled with the manufacturer's identification and printed instructions. All material shall be stored and handled in accordance with the manufacturer’s instructions and recommendations. Protect from damage.

1.09 PROJECT CONDITIONS

A. Perform Work only when ambient conditions are within the limits established by manufacturers of the materials and products used.

B. Proceed with Work related to composite sheet waterproofing only when substrate construction and penetrating Work is complete, and the concrete or mortar has cured for at least 28 days.

C. Provide ventilation in accordance with the approved manufacturer's written requirements and recommendations throughout application and curing for all materials specified in this Section.

1.10 WARRANTY

A. Provide written warranty signed by manufacturer, agreeing to repair or replace Work which exhibits defects in materials or Workmanship. "Defects" shall include, but not be limited to, leakage of water, abnormal aging or deterioration, and failure to perform in accordance with the requirements of the Contract Documents. Include requirement for removal and replacement of covering and connected adjacent Work. Warranty periods shall be as follows:

1. Sealants and Crack Control Materials: 5 years from date of Substantial Completion
2. Waterproofing: 10 years from date of Substantial Completion
3. Exterior sealants: 20 years from date of Substantial Completion

1.11 PRE-INSTALLATION MEETING

A. The General Contractor shall schedule a pre-installation meeting to establish compliance and expectation of Work, maintain optimum working conditions, determine acceptable mock-ups, and coordinate the Work of this Section with related and adjacent Work. The meeting shall be attended by the General Contractor, Owner's Project Manager, Architect, and related subcontractors.

B. Advise other trades to ensure that no other Work adversely effects sealer bonding surfaces.

**PART 2 - PRODUCTS**

2.01 GENERAL REQUIREMENTS

A. Each sealant shall be checked for adhesion and compatibility with all adjacent materials. Select a sealant that is recommended by the approved manufacturer for the specified application.

B. The color of each sealant shall be selected by the Architect from the approved manufacturer's complete selection of standard and premium colors.

2.02 EXTERIOR SEALANT

A. Provide high-performance, single-component, moisture-cure, ultra-low modulus silicone sealant, Spectrem 1 as manufactured by Tremco or equal by Dow or W.R. Meadows. The sealant shall comply with the following properties:

1. As Supplied:
   a. Curing Time 7 to 14 days
   b. Flow, Sag or Slump Inches Nil, ASTM C639
   c. Full Adhesion 14 to 21 days
   d. Tack Free Time 30 to 60 min., ASTM C679
   e. Tooling Time 10 to 20 min., Skin Formation
   f. Extension +100
2. As Cured, After 14 Days at 77°F (25°C), 50%RH:
   a. Hardness (Shore A) +15, ASTM C661
   b. Peel Strength Aluminum & Glass 30 pli (5.2 kN/m), ASTM C794
   c. Stain & Color Change None, ASTM C510 TT-S-001543A.

| | | |
|---|---|---|
| d. | Staining of Porous Substrates, White Marble Primed & Unprimed | ASTM C1248 No Stain |
| e. | Tear Strength, Die ("C") | 40 pli (0.7 kN/m), ASTM D624 |
| f. | Tensile Strength at 100% Elongation | 35 psi (0.24 MPa), ASTM C1184 |
| g. | Tensile Strength at Max Elongation | 200 psi (1.38 MPa), ASTM D412 |

2.03 INTERIOR SEALANT

A. Provide single component, acetoxy silicone sealant, Tremsil 200 by Tremco, Inc. or equal by Pecora or Sika. Sealants at all interior joints and similar applications, shall conform to the following requirements:

1. Type S, Grade NS, Class 50, Use NT, G, A and O; in accordance with requirements of ASTM C 920
2. Class A; in accordance with requirements of Federal Specification TT-S-230 and TT-S-001543A
3. Dynamic Movement Capability: +/- 50%; in accordance with requirements of ASTM C 719
4. FDA regulation 21 CFR 177. 2600
5. Shore A hardness of 25-35; in accordance with requirements of ASTM C 661
6. Elongation: 450%; in accordance with requirements of ASTM D 412
7. Tensile Strength @100% Elongation: 45-55 psi; in accordance with requirements of ASTM D 412
8. Ultimate Tensile Strength; 165 psi; in accordance with requirements of ASTM D 412
9. Peel Strength: 25-35 pli; in accordance with requirements of ASTM C 794
10. Recycled Content: 11% Post-Industrial

B. Provide non-sag, acrylic latex sealant, AC-20 + Silicone as manufactured by Pecora or equal by Pecora or Sika. Sealants for general purpose interior caulking to conform with the following requirements:

| | | |
|---|---|---|
| 1. | Adhesion Loss (%): | 0.5, ASTM C736 |
| 2. | Elongation, Ultimate (%): | 200, ASTM D412 |
| 3. | Extrudability (g/sec): | 9.8, ASTM C731 |
| 4. | Low-Temperature Flexibility (pass/fail): | Pass, ASTM C734 |
| 5. | 100% Modulus (psi): | 60-65, ASTM D412 |
| 6. | Tensile, Ultimate (psi): | 80-90, ASTM D412 |

2.04 INSULATING FOAM SEALANT

A. Provide polyurethane-based insulating foam sealant, Tite Foam Big Gaps as manufactured by Loctite or equal by Tremco or Sika Emseal. The insulating foam sealant shall seal gap between window, rough opening, metal deck flutes, and stud walls. The insulating foam sealant shall comply with the following characteristics:

| | | |
|---|---|---|
| 1. | Color: | White |
| 2. | Appearance: | Foam |
| 3. | Specific Gravity: | 1.107 |
| 4. | Flash Point: | <20 deg. C |

5. VOC Content: 208.6 g/l, SCAQMD Rule #1168
6. Shelf Life: 12 months from date of manufacture

2.05 MISCELLANEOUS MATERIALS

A. Provide appropriate surface primers and accessories for surfaces to be adhered to, in accordance with the approved manufacturer's written requirements.

B. Provide bond breaker tape No. 40 or No. 531 (heavy duty), as manufactured by Valley Industrial Products, or equal by Decker, in accordance with the approved manufacturer's written requirements, appropriate for the sealant being used.

C. Provide backer rods compatible with the specified sealant, and as follows:
   1. Backer rod for all building joints shall be non-absorbing, with highly resistant interior network of closed and open cells, SOF ROD as manufactured by Applied Extrusion Technologies or equal.
   2. The backer rod for paving and floor joints shall be closed cell polyethylene rod extruded in continuous lengths, GREEN ROD as manufactured by NMC, or equal.

D. Sealant shall be non-drying, non-hardening, non-bleeding, non-staining sealant complying with ASTM C 834 and C 919, USG sealant, or equal by Pecora or Tremco.

**PART 3 - EXECUTION**

3.01 INSPECTION

A. For each material the installer shall examine substrates, supports, and conditions under which this Work is to be performed and notify General Contractor, in writing, of conditions detrimental to the proper completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected. Beginning Work means Installer accepts substrates and conditions.

B. Strictly comply with the approved manufacturer's written instructions and recommendations, except where more restrictive requirements are specified in this Section.

3.02 JOINT SEALANTS AND FILLERS

A. Clean joint surfaces immediately before installation of sealants, primers, tapes and fillers. Remove all substances which could interfere with bond. Prime, etch, or roughen joint surfaces as necessary to improve bond. Tape or mask adjoining surfaces to prevent spillage and migration problems. Provide backer rods for all liquid sealants except where specifically recommended by sealant manufacturers. Prevent three-sided adhesion by use of bond breaker tapes or backer rods.

B. Force sealant into joints to provide uniform, dense, continuous ribbons free from gaps and air pockets. Install sealants so that compressed sealants do not protrude from joints. Dry tool sealants to form a smooth dense surface with joint surfaces adhering equally on opposite sides. At horizontal joints form a slight cove to prevent trapping water. Except in hot weather, make the sealant surface slightly concave.
   1. Make sealant joint depth equal to joint width for joints up to 1/2 in. wide. For joints over 1/2 in. wide, make depth equal to one-half of the joint width. Joint depth at exterior silicone sealant shall not be greater than 1/2 in.

2. Fill all joints solidly and continuously with a sealant, neatly applied with a standard caulking gun in a continuous motion, using slight pressure. "Push" the sealant bead ahead of the nozzle; do not "drag" the nozzle.
3. Within 5 minutes of sealant application and before sealant skins over, dry tool the joint surface with a concave tool to ensure intimate contact with substrate and to eliminate air bubbles. Do not use any liquid for tooling. Provide a smooth, uniform, finished surface.
4. Avoid contaminating adjacent surfaces with excess sealant. Remove all traces of smears and droppings on metal, stone, glass, or other surfaces promptly, using a solvent recommended by the sealant manufacturer and that shall not damage or discolor the building surfaces. Remove smears and droppings on face surfaces by mechanical means after the initial cure of the sealant.
5. Coordinate Work with other trades to prevent contamination of fresh sealant by dust or other debris. Do not seal over any epoxy placements which are not cured.
6. Install internal wall joints to maintain connectivity between vertical and horizontal constructions. Extend internal sealant to the face of wall and as otherwise directed by Architect to compartmentalize waterproofing protection.
7. Install internal sealant materials at sufficient depth (2 1/2 in.+) to maintain 3/4 in. clear unobstructed cavity between the finish face of internal sealant and back of external sealant backing material.
8. Internal joint integrity shall be equal to external joint integrity. Internal seals are primary seals to prevent internal building water intrusion.

C. Seal all interior and exterior joints, seams, intersections between dissimilar materials, unless specifically noted to be performed under the Work of other Sections.
   1. The Work of this Section shall include, but not be limited to, sealing exterior of the building at the following locations:
      a. Building expansion and control joints
      b. Intersections of masonry to dissimilar materials, excluding exterior windows and all aluminum entrances and storefronts, steel door frames, EIFS, and curtainwalls.
      c. Penetrations through exterior masonry veneer
      d. Concrete to concrete at cold joints, cast stones.
      e. Expansion joints in concrete walks
      f. Vertical wall flashing terminations and reglets.
      g. At CMU to gypsum wallboard to concrete, gypsum wallboard to metal deck, countertops, wood to CMU, or gypsum wallboard.
   2. The Work of this Section shall include, but not be limited to, sealing interior of the building at the following locations:
      a. Insulating foam sealant inside metal deck flutes at intersecting joints between top of gypsum drywall and metal decks.
      b. Perimeters of all steel door frames, steel borrow light frames, and other metal frames.
      c. Perimeter of interior windows, aluminum entrances and storefronts, curtainwall frames, and translucent roof assembly frames, skylights, louvers at dissimilar materials
      d. All intersecting joints between gypsum drywall and dissimilar materials

e. Tile to tile joints inside corners and all joints between tile surfaces and dissimilar materials.
f. Backsplash to counter joints and backsplash to wall joints at countertops
g. Completely around all plumbing fixtures, fittings, and trim to countertops, walls, and floors
h. At the tops of stringers and landings to wall junctures at all stairways.
i. At the perimeters of all backsplashes to wall, ends, and backsplash to counter whether a sink is present or not and all counter to wall areas with no backsplash.
j. At all slab-on-grade construction joints, control joints, and column bases.)
k. Louvers

D. Cure sealants in strict compliance with the approved manufacturers' instructions and recommendations to obtain highest quality surface and maximum adhesion. Make every effort to minimize accelerated aging effects and increase modulus of elasticity.

3.03 REPAIR AND CLEANING

A. Remove and replace Work which is damaged or deteriorated in any respect.

B. Clean adjacent surfaces using materials and methods recommended by system manufacturer. Remove and replace Work that cannot be successfully cleaned.

3.04 RUBBISH REMOVAL

A. The General Contractor shall remove and dispose daily of all waste and debris in accordance with the requirements of Section 01 50 00 – Temporary Facilities and Controls.

**END OF SECTION**

# SECTION 220000

# PLUMBING

## PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include General Conditions and applicable parts of Division 1 as part of this Section.

B. Examine all other Sections of the Specifications for any Requirements that affect Work of this Section, whether or not such Work is specifically mentioned in this Section.

C. Coordinate Work with that of all other Trades affecting, or affected by, Work of this Section. Cooperate with such Trades to assure the steady progress of all Work under the Contract.

1.02 SCOPE OF WORK

A. Work in this Section includes all labor, materials, equipment and services necessary to furnish completely and install all Plumbing Systems as indicated on the Drawings and specified herein, and in general as follows:

1. Disconnect, make safe, cut and cap, and demolish existing equipment, piping and appurtenances as may be required to accommodate the new work. This Contractor shall be responsible for removal and disposal of all debris generated by the demolition of the plumbing systems.

2. Roof drains and interior Storm drainage System piping.

3. Insulation.

4. Hangers and supports.

5. Testing.

6. Operating instructions, maintenance manuals, and Record Drawings.

7. Obtain and pay for all inspections, licenses, permits, and approvals required by Governing Authorities and install all work in compliance thereof.

B. Examine all Project Documents for any Requirements that affect the Work of this Section, whether or not such Work is specifically mentioned in this Section.

1.03 RELATED WORK UNDER OTHER SECTIONS

A. The following Work is not included in this Section but is to be performed by other Trades as specified within the other Sections.

1. Cutting and patching shall be performed by Trades specializing in the specific surfaces affected, i.e.: carpentry, masonry, metals, etc.

2. Coring of all holes required to install plumbing piping.

3. Firestopping of fire-rated assembly through penetrations.

4. Painting of piping, fittings, coverings, hangers, supports, and all equipment not specifically specified to be painted by this Contractor.

5. Flashing of all Plumbing System roof penetrations.

1.04 INTENT

A. All Work shall be in accordance with the arrangement, details, and locations, as indicated on the Contract Drawings, Reference Drawings and any supplemental Addenda, Bulletins or Drawings issued by the Architect. Layouts are diagrammatic and final arrangement of equipment and piping shall suit field conditions. Install all necessary fittings and equipment offsets required to meet job conditions. Work installed in a manner contrary to that shown on the Drawings, or interfering with the Work of another Trade, shall be removed and reinstalled when so directed by the Architect. Discrepancies and questionable points shall be immediately reported to the Architect for clarification.

1.05 CODES, REGULATIONS, AND STANDARDS

A. All Work shall be installed in compliance with the governing Codes, Regulations, and Ordinances. It shall be the responsibility of this Contractor to familiarize himself with all governing Codes, Regulations, and Ordinances prior to entering into a Contract.

B. If the Contractor observes that the Drawings or Specifications are at variance with any applicable Codes, Laws, Ordinances, or Rules or Regulations, it shall promptly notify the Architect in writing, and any necessary changes shall be made as provided in the Contract for changes in the Drawings and Specifications. If the Contractor performs any Work knowing it to be contrary to such Codes, Laws, Ordinances, or Rules or Regulations, without giving such notice to the Architect, it shall bear all costs of corrective work arising therefrom.

C. All workmanship, methods, and materials shall meet the highest standards of the Trade and, in general, shall conform to the standards of the following associations:

American Standards Association (ASA)
American Society of Mechanical Engineers (ASME)
National Board of Fire Underwriters (NBFU)
Standard of Underwriters Laboratories (UL)
American Society of Testing Materials (ASTM)
National Electric Code - NFPA 70 (NEC)
National Fire Protection Association (NFPA)
Occupational Safety and Health Act (OSHA)
American National Standards Institute (ANSI)
Building Officials and Code Administrators (BOCA)

American Society of Sanitary Engineering (ASSE)
American Society of Plumbing Engineers (ASPE)
Massachusetts State Building Code (780CMR)
Massachusetts State Plumbing and Gas Codes (248CMR)
Worcester Building Regulations and Ordinances

D. Where the contract documents indicate more stringent requirements than the above codes and ordinances, the Contract Documents shall take precedence.

E. All above Requirements shall take precedence over the Plans and Specifications. These Requirements are minimum criteria and no reductions to the quality or capacity of the Systems that may be permitted by Code will be allowed without written permission of the Architect.

1.06 DRAWINGS AND CONFLICTS IN THE WORK

A. The Drawings and Specifications are intended to be complementary. Any materials shown or specified in one, but not in the other, reasonably implied and usually included under good industry practice and/or required by applicable Codes and Regulations for the proper and safe completion and operation of the Work described herein, shall be furnished and installed by this Contractor at no additional cost to the Owner.

B. In the case of an inconsistency between Drawings and the Specifications, or within either document which is not clarified by addendum, the product(s) of greater quality and/or greater quantity of work shall be provided by this Contractor at no additional cost to the Owner.

C. In the case of an inconsistency between the Drawings and Specifications, the Designer shall determine the intent, and the Designer's interpretation shall be final and shall be provided by this Contractor at no additional cost to the Owner.

D. Drawings show general location and arrangement of equipment and piping, and are not intended to indicate the exact installation dimensions.

E. Any conflicts and/or non-compliance of the Drawings and Specifications apparent at the time of the start of the project shall be brought to the attention of the Architect and/or Engineer prior to entering into a contract.

F. If the Contractor performs Work knowing it to be contrary to any Codes, Laws, or Regulations, without giving such notice to the Designer and Awarding Authority, the Contractor shall bear full responsibility for such Work and all costs attributable thereto, including, without limitation, corrections to the Work already performed.

1.07 EXCHANGE OF INFORMATION AND COORDINATION

A. All Work covered by this Section of the Specifications shall not be installed without first coordinating the installation of same with all other Trades and the General Contractor. This Contractor shall, at his own expense, relocate any of his Work should it interfere with the proper installation and/or operation of the Work to be installed by other Trades and by the General Contractor.

B. Particular attention shall be directed to the coordination of this Work with all Work of other Trades which is to be installed in the ceiling areas. Coordinate, with all other Trades, the Work in suspended ceiling areas to insure adequate space for the installation of all Work of all Trades, prior to installation.

C. Coordination of this Work with all other Trades will require that this Contractor attend on-site coordination meetings and develop coordination Drawings so as to ensure that all Trades will be provided with adequate space to install their Work.

D. Furnish to the General Contractor, and all other Contractors, all information relative to the Work of this Section that will affect them, sufficiently in advance, so that they may plan their Work and installation accordingly.

E. In the case of failure on the part of this Contractor to provide proper information, as indicated above, sufficiently in advance, this Contractor will pay for all back-charges incurred by the General Contractor and other Contractors for the modification and/or relocation of any portion of their Work already performed in conjunction with this Contract due to this Contractor's delay or for having given incorrect information.

F. Obtain from all other Trades all information relative to the Work covered by this Section of the Specifications, which this Contractor is to execute in conjunction with the installation of the Work of the other Trade(s).

G. In the event that conflicts, if any, cannot be settled rapidly and amicably between the affected Trades, with the Work proceeding in a skillful and competent manner, the Architect shall decide which Work is to be relocated and his judgment shall be final and binding.

1.08 WORKMANSHIP

A. The entire Work provided in this Specification shall be constructed and finished, in every respect, in a skillful, competent, and substantial manner. It is not intended that the Drawings shall show every component, pipe, and detail, but this Contractor shall furnish and install all such parts as may be necessary to complete the Work in accordance with governing Codes and Regulations, the best Trade practices, and to the satisfaction of the Architect, Engineer and the Owner, at no additional cost to the Owner.

1.09 SITE INVESTIGATION

A. It shall be the responsibility of the Bidders to acquaint themselves with the available information, before submitting their Bid. Bidders should visit the site and acquaint themselves with the existing conditions and shall study all Architectural, Structural, Mechanical and Electrical Drawings, as well as the Specifications. The Bidders shall fully inform themselves of all local and state Code Requirements. Bidders must report any conflicts and/or non-compliance of the construction documents to the Architect for review prior to submitting their bid.

1.10 TAXES AND INSURANCE

A. This Contractor shall include in his Bid, applicable federal, state and local taxes and the premiums of the insurance required by the General Conditions and Supplementary General Conditions of the Contract.

1.11 PERMITS AND INSPECTIONS

A. This Contractor shall obtain and pay for all the permits required for this Section of the Work. He shall also obtain and pay for all the inspections and tests required by the local authority, and coordinate with same. Defects discovered in Work, materials, and/or equipment shall be replaced at no cost to the Owner, and the inspection and test shall be repeated until no defects are discovered.

B. No work shall be covered or concealed until it has been inspected and approved by the Engineer. This Contractor shall be responsible for coordinating these inspections with the General Contractor and the Engineer at appropriate times during the course of construction.

C. Availability of Record Drawings shall be a prerequisite to scheduling an Engineer's rough or final inspection of this Work and said Drawings and Original Contract Documents will be used in checking completion of the Work. For rough inspections, this Contractor's marked-up drawings will be sufficient. (Refer to section 3.4)

D. Non-availability of Record Drawings or inaccuracies therein may be grounds for cancellation or postponement of any scheduled Engineer's inspection of the Work until such time as the availability or discrepancy has been corrected.

E. Work which has been covered or concealed prior to the Engineer's inspection shall be uncovered or exposed, and then recovered or reconcealed, only after the Engineer's review and approval, the cost of which shall be borne by the General Contractor.

F. The Engineer has a limited number of inspections in its Contract. The General Contractor and this Contractor should be aware of the quantity and possible frequency of these inspections and coordinate their Work accordingly. Additional inspections may be provided, the cost of which shall be borne by the General Contractor.

1.12 CONTRACT COST BREAKDOWN

A. At the start of construction, submit a breakdown of material and labor costs to aid the Architect in determining the value of the Work installed, as the job progresses. The cost breakdown shall itemize categories of materials or portions of Systems, as may be the case, to place a value on the Work as it is installed.

B. No requisitions will be paid until after the breakdown is approved by the Architect.

1.13 GUARANTEE

A. Unless otherwise noted, all materials, items of equipment and workmanship furnished under this Section shall carry the standard warranty against all defects in material and workmanship for a period of not less than one (1) year from the date of final acceptance of the Work. Any fault due to defective or improper material or workmanship which may develop within that period, shall be

made good, forthwith, by and at the expense of this Contractor, including all other damage done to areas, materials and other Systems resulting from this failure.

B. This Contractor shall guarantee that all elements of the Systems are of sufficient capacity to meet the specified performance Requirements as set forth herein or as indicated.

C. Upon receipt of notice from the Owner of failure of any part of the Systems during the guarantee period, the affected part or parts shall be promptly replaced by this Contractor, at no charge to the Owner.

D. Before the final payment is made, this Contractor shall furnish a written guarantee covering the above Requirements.

1.14 MATERIALS

A. Materials shall be the best of their respective kinds and in full accord with the most modern mechanical construction. All materials shall be new and approved for use in Massachusetts.

B. All materials necessary to make the installation complete in every detail shall be furnished and installed under this Contract, whether or not specifically shown on the Drawings or specified herein.

C. It is the intent of the Specifications that one manufacturer be selected, not a combination, for any particular classification of materials.

D. Where materials, equipment apparatus, or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish the standard of desired quality and style and shall be the basis of the Bid.

1.15 MATERIALS AND EQUIPMENT HANDLING

A. This Contractor shall do all handling of his materials and equipment and the resulting cleanup, at his expense, in a safe and a satisfactory manner. Special attention shall be paid to the protection of life and property and the equipment or apparatus handled, and any corresponding damages shall be replaced, repaired, or paid for by this Contractor. This Contractor shall provide all rigging, hoisting, and staging required to complete the Work of this Section, unless specifically noted otherwise.

B. Provide, maintain, and remove safe and adequate interior and exterior staging, scaffolding, hoists, and all other related equipment necessary for proper and complete execution of the Work of this Section in accordance with the requirements of the Contract Documents.

C. Staging, scaffolding, hoists, and all other related equipment shall comply with all applicable Federal, State, and Local regulations and codes.

D. Staging, scaffolding, hoists, and all other related equipment shall be maintained to complete the Work, and removed when no longer required.

1.16 MAINTENANCE AND PROTECTION OF MATERIALS

A. This Contractor shall be responsible for the maintenance and protection, from loss or damage of all causes, of all equipment, materials, and tools supplied by him and stored or installed on the job site, until final acceptance of the Project by the Owner.

B. This Contractor shall store his materials and equipment in the location designated by the Owner or Architect and maintain the storage area in a clean and safe condition.

C. This Contractor, at his own expense, shall clean, patch and repair any material and finishes of the building or its contents damaged during the execution of this Contract. Patches and repairs shall be performed by Trades specializing in the specific surfaces affected.

1.17 SUBMITTALS

A. Submit one complete package of Manufacturer's data sheets for all products, materials, equipment, and accessories intended to be used in the construction of the Systems in accordance with this Section and the provisions of Section 013300, Submittals.

1. Manufacturers' data sheets shall be submitted in one complete package. Incomplete or partial submittals will not be accepted or reviewed.

2. Multiple separate submittals submitted electronically through a construction software program (i.e. ProCore) will not be accepted. The operator of the software program shall receive, organize, and compile all cover sheets and manufacturer's data sheets into one complete package for submittal to the Engineer.

3. Manufacturers' data sheets shall be organized in a sequence identical to these specifications.

4. Manufacturers' data sheets shall be marked to indicate all specific sizes, capacities, materials, gauges, thicknesses, coatings, finishes, colors, models, optional equipment, and accessories. Manufacturers' data sheets not marked as such may not be accepted or reviewed.

5. Data sheets shall be specific to the manufacturer and product being submitted. Brochures or sales sheets will not be accepted or reviewed.

6. All submittals shall be reviewed by the General Contractor for correctness, completeness, and compliance with these Contract Documents, and shall be stamped as such by the General Contractor prior to submission to the Architect or Engineer for review.

7. Review of incorrect, incomplete, or rejected submittals which require resubmission shall be paid for by this Contractor.

8. All submittals shall be submitted with sufficient time for the General Contractor, Architect, and Engineer to review. Be advised that MGL Chapter 30, Section 39P allows the Engineer the right to a 30-day review period. This applies to all submittals, whether the original submission or any subsequent revisions and resubmittal(s) thereto.

9. All products, materials, equipment, and accessories must be approved prior to installation.

10. Delays in the Work caused by incorrect, incomplete, or rejected submittals, or delays in submitting the same, shall be borne by this Contractor.

B. The approval of products, materials, equipment, or fixtures does not relieve this Contractor from the responsibility of Submittal errors in options, accessories, finishes, details, sizes, colors, quantities, or dimensions which deviate from the Specifications, Contract Drawings, and/or job conditions, as they exist.

C. If products, materials, equipment, or accessories are substituted by this Contractor for those specified and such substitution necessitates changes in any mechanical or electrical equipment, or alteration to connections, piping supports, or construction, same shall be provided by this Contractor at no additional cost to the Owner.

D. The Architect's permission to make substitutions shall not relieve this Contractor from full responsibility for the Work.

E. Changes to Work already performed, made necessary by delays in submittal approval, are the responsibility of this Contractor.

F. No work shall be allowed to take place on the premises until all submittals have been received, reviewed, and approved by the Engineer.

1.18 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

A. Provide operating instructions to the Owner's designated representative, with respect to operating and maintenance procedures, for all equipment and Systems installed under this Section. Operating instructions shall be given by the manufacturers' representatives. The cost of such instruction, up to a full four (4) hours, shall be included in the Contract price.

B. At the completion of the Project, turn over to the Architect two (2) complete Maintenance Manuals containing the following, in order, with tabs separating and identifying each section:

1. Contractor letter of guarantee.

2. Copy of fully executed permit(s).

3. Hard copy of approved As-Built Drawings.

4. Flash drive of approved As-Built Drawings in PDF and AutoCAD format.

5. Complete approved submittals of all materials and equipment installed.

6. Names, addresses and telephone numbers of all suppliers of the materials and equipment. Supplier list shall indicate which products were provided by which supplier.

7. Manufacturers' printed warrantees for all materials and equipment.

8. Manufacturers' repair and preventative maintenance instructions for all equipment, including parts diagrams.

9. Test results.

10. Other documentation of permits, inspections, tests, etc. as applicable.

C. Each manual shall be typewritten and bound under a separate hardcover 3-ring binder and will be reviewed by the Architect. The manuals shall be clearly and permanently identified on the cover and binding with the name of the Project.

D. Availability of Record Drawings shall be a prerequisite to scheduling the Engineer's final inspection of this Work.

E. Refer to Section 017700, Project Closeout, for general provisions covering Project closeout procedures.

1.19 CLEANING SYSTEMS

A. Before the Systems are accepted, all piping and equipment shall be thoroughly cleaned to remove all grease, oil, flux, dust, dirt and/or other foreign matter.

B. After the installation is complete, equipment with factory-finished surfaces shall be cleaned and damaged or scratched spots shall be touched up with the same type and color paint applied at the factory.

C. All piping and equipment that is to receive finish paint by the Painting Contractor shall be cleaned by this Contractor and left ready to have surfaces prepared to receive paint.

D. All piping that is to receive paint shall not have any identifying labels, tags, markings, etc. (except for UL, FM, and code required nameplates) which would interfere with the preparation and painting of the surfaces.

E. All piping shall be protected from the elements, and from construction dust and debris.

1.20 RUBBISH REMOVAL

A. At the completion of the Work, or when ordered by the General Contractor or the Architect, this Contractor shall remove from the property, all the rubbish and waste materials belonging to him. Keep the job site free from the accumulation of waste materials and rubbish; premises must be maintained in a clean condition.

1.21 TEMPORARY STRUCTURES

A. This Contractor shall provide, on the premises and where directed by the Architect, shall maintain in good condition, and shall remove when directed, suitable and substantial watertight sheds in which he shall store all his materials and equipment.

1.22 TEMPORARY SERVICES

A. All water, electricity, fire protection and sanitary facilities required for safe and efficient construction during normal working hours shall be furnished in accordance with the General Requirements and Supplementary General Requirements.

1.23 TESTS

A. Furnish all labor, materials, instruments, supplies, and services and bear all cost for the accomplishment of the tests herein specified or required by governing Authorities. Correct all defects appearing under test, repeat the tests until no defects are disclosed, and leave the equipment clean and ready for use.

B. Perform any tests, other than herein specified, which may be specified by legal authorities or by agencies to whose Requirements this Work is to conform.

C. Dispose of test water and wastes after tests are complete, in a manner satisfactory to the Architect and in accordance with governing Regulations.

D. This Contractor shall coordinate and facilitate all inspections and tests required by Codes or the Authorities Having Jurisdiction.

1.24 EQUIPMENT ACCESS REQUIREMENTS

A. All Work shall be installed so that all equipment may be replaced without the removal of piping, accessories, or other equipment.

B. All Work shall be installed so that all parts requiring inspection, operation, maintenance and repair are readily accessible.

C. Minor deviations from the Drawings may be made to accomplish this, but changes of magnitude shall not be made prior to written approval from the Architect.

D. Furnish access panels as required to permit access for adjustment, removal and the replacement and servicing of all equipment, and all other items requiring maintenance and/or adjustment.

E. Access panels shall be installed by the General Contractor.

F. Coordinate the type and exact location of access panels in all finished spaces with the Architect.

1.25 INSTALLATION REQUIREMENTS

A. This Contractor shall comply with all the governing Codes, Regulations, and Ordinances of all legally constituted Authorities having jurisdiction over the whole or any part of the Work herein specified. Governing Codes and Regulations supplement this Specification and shall take precedence in any case of conflict.

B. All equipment and materials furnished in connection with the installation shall be new and shall be furnished and installed in accordance with these Specifications and the Manufacturer's requirements.

C. All piping shall be installed concentrically within any floor, ceiling or wall penetration so as to allow for proper sealing of the penetration while maintaining the sealant flush with the adjoining surfaces.

## PART 2 - PRODUCTS

2.00 PRODUCT APPROVAL

A. All piping, fittings, materials, equipment and appurtenances to be installed under this Section of the Work shall be approved for use in Massachusetts in accordance with 248CMR.

B. Where materials, equipment, apparatus, or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish the standard of desired quality and style and shall not be construed as fulfilling the requirements of 248CMR.

C. It shall be the responsibility of this Contractor to ensure that all items submitted to the Engineer to be installed in association with this Work comply with all requirements of 248CMR.

D. Approval by the Engineer of items submitted does not relieve this Contractor from the responsibility of complying with the requirements of 248CMR.

E. Installed items which do not meet the requirements of 248CMR shall be removed and replaced with approved products by this Contractor at no additional cost.

2.01 PIPE AND FITTINGS

A. Storm Piping

1. Piping materials for storm piping systems inside the building above the floor slab including soil, waste, and vent piping, unless otherwise noted, shall be standard weight, coated, hubless cast iron pipe and fittings manufactured in accordance with ASTM A-888 and the Cast Iron Soil Pipe Institute's Standard No. 301. The pipe shall be cast in one piece and shall be legibly marked on the barrel with the manufacturer's name and/or trademark. Couplings shall be heavy duty neoprene gasket with stainless steel clamp, screw and shield, manufactured in accordance with ASTM C-1540.

2.02 PIPE HANGERS, SUPPORTS, AND CHANNELS

A. All piping shall be rigidly supported from the building structure by means of approved hangers and supports. Pipes shall be supported so as to maintain the required grading and pitching of lines, to prevent vibration and to secure piping in place; they shall be arranged so as to provide for proper expansion and contraction of pipe.

B. All piping and their attachments shall be designed for seismic forces as per the Requirements of the Massachusetts Building Code, Section 1613. It shall be the responsibility of this Contractor to provide all necessary calculations as required by the Building Code. One copy shall be submitted to the Engineer for his review, and one copy shall be submitted to the Structural Engineer for approval of attachments to the building structure. All Work of this Section shall be

installed in accordance with the seismic Requirements of 780 CMR. It shall be the responsibility of this Contractor to coordinate the installation of his Work with said Requirements.

C. Maximum spacing of hangers on horizontal runs of pipe shall be in accordance with the following:

1. Cast Iron: < 10'-0" length 5'-0" o.c.
≥ 10'-0" lengths 10'-0" o.c.

D. If Codes having jurisdiction or manufacturers' installation instructions require closer spacing, the hanger spacing shall be as required by Code in lieu of the foregoing. Provide hangers at all changes in direction and on both sides of concentrated loads (pumps, valves, strainers, regulators, etc.).

E. All horizontal piping 2" and smaller shall be supported with adjustable band hangers. All piping 2½" and larger shall be supported by adjustable clevis hangers. Vertical piping shall be supported by extension type split ring hangers along the wall, and riser clamps where passing through floors. Hangers and clamps for uncovered (un-insulated) copper and brass piping shall be factory applied plastic coated steel or copper hangers. Hanger rods shall have machine threads.

F. All hangers on insulated lines shall be sized to fit the outside diameter of the pipe insulation. Provide pipe covering protection saddles at all hangers on insulated lines of sheet metal 18 gauge and twelve inches (12"), minimum length, and shall cover 180 degrees of arc (lower quadrants) on the covering at all hangers on insulated piping systems.

G. All hangers, riser clamps, rods, supports, channels, hardware, and accessories shall be galvanized. Hangers or riser clamps in direct contact with copper pipe shall be copper or plastic coated steel.

H. All piping installed under this Section of the Specifications shall be independently supported from the building structure and not from the ceiling, walls, piping, ductwork, or conduit of other Trades. All supplementary steel, including factory-fabricated channels required to meet the Requirements specified herein, shall be furnished and installed by this Contractor.

2.03 INSULATION

A. All new pipe and fittings shall be insulated with Owens/Corning Fiberglas SSL-II-ASJ molded glass fiber insulation, or approved equal. Glass fiber insulation shall have a minimum density of 3¼ pounds per cubic foot with a thermal conductivity ("K" value) ranging from 0.21 to 0.28 at 100°F mean temperature. Insulation shall have a flame spread rating of 25 or less, a smoke developed rating of 50 or less, and a factory applied all service vapor barrier jacket. Insulation shall be compliant with the IECC 2015.

B. All interior storm drainage system piping, including roof drain bodies, shall be insulated with half-inch (½") thick fiberglass insulation.

C. Insulate all fittings, flanges, valves, etc., for the services requiring insulation, same as specified for their respective piping, with white PVC fitting covers as manufactured by Zeston or approved equal, installed in accordance with the manufacturer's instructions.

D. All longitudinal joints and joints between adjacent sections of insulation shall be butt tightly together, lapping joints with butt strip seals and vapor barrier cement.

E. Plain ends shall be sealed with vapor barrier cement.

F. No piping shall be insulated until the Engineer's rough inspection has been completed and all pipe sizes have been verified in the field. Any insulation which has been installed prior to the Engineer's inspection shall be removed and reinstalled by this Contractor at no additional expense to the Owner. This Contractor shall phase the work and request the Engineer's inspection at the appropriate time. No claims for delays or additional compensation will be entertained due to this Contractor's failure to follow these instructions.

2.04 CLEANOUTS

A. Clean-outs shall be installed where indicated on the Drawings and/or where required in storm drain pipes. Clean-outs shall be installed at the base of all risers and at each change of direction.

B. Clean-out plugs shall be heavy cast brass of the screwed type, full size up to and including four inches (4").

C. Clean-outs shall be same material and size as piping up to four inches (4") in size and not less than four inches (4") for piping larger than four inches (4").

D. Access to clean-outs in walls and/or ceilings shall be provided by an access panel.

2.05 DRAINS

A. Drains (floor, roof, area, parking) shall be installed where shown on the Drawings and where required by Code.

B. Roof drain "RD-A" shall be equal to Zurn model ZC100-DP-E epoxy coated cast iron roof drain with flashing clamp with integral gravel stop, top set deck plate, low profile ductile iron dome, static extension, and no-hub outlet. Strainer free area to be 1.5 times the area of pipe connected thereto. Outlet size to be as shown on the drawings. Extension height varies, height to be as required to suit final conditions.

C. Roof drain "RD-B" shall be equal to Zurn model ZC100-E-R epoxy coated cast iron roof drain with flashing clamp with integral gravel stop, sump receiver, low profile ductile iron dome, static extension, and no-hub outlet. Strainer free area to be 1.5 times the area of pipe connected thereto. Outlet size to be as shown on the drawings. Extension height varies, height to be as required to suit final conditions.

**PART 3 - EXECUTION**

3.01 OPERATION AND START-UP

A. Furnish all labor, equipment, materials, and test necessary to place all equipment and Systems into operation, and obtain approval of the entire Plumbing System from the local building department.

B. Materials, fixtures and fittings shall be properly protected and all pipe openings shall be temporarily closed so as to prevent obstructions and damage.

C. Prior to final inspection, clean all fixtures and flush all piping and equipment and then place all equipment and fixtures into working order to demonstrate the fitness of the installation.

3.02 COORDINATION

A. The structure and its appurtenances, clearances and the related services, such as plumbing, heating, ventilation, air conditioning, and electric service, have been planned to be adequate and suitable for the installation of equipment specified under this Section. The Owner will not assume any increase in cost caused by differing Requirements peculiar to a particular make or type of equipment, and any such incidental cost shall be borne by this Contractor.

B. This Contractor shall be responsible for Work and equipment furnished and installed by him or his Subcontractor(s) until the completion and final acceptance of this Contract, and he shall replace any Work that may be damaged, lost, or stolen, without additional cost to the Owner.

C. Cutting and Patching - It shall be the duty of this Contractor to consult with and give to the General Contractor, the exact location and size of all openings and full information as to cutting and patching necessary for the same.

D. In the event this Contractor fails to provide sleeves, inserts, and templates or fails to notify other Contractors well in advance of his Requirement, he shall be responsible for paying for all cutting and patching made necessary by his failure to do so.

E. The location and method of attaching supports for plumbing equipment to the building structure shall be coordinated with the Architect and General Contractor prior to the installation of any equipment. This Contractor shall take necessary precautions to ensure the building structure and components are not over stressed by the support of plumbing equipment.

F. In the event there is a conflict or inadequate space for the proper installation of plumbing Systems, this Contractor shall prepare a scaled (¼" = 1'-0" min.) composite sketch, showing the building structure and all equipment and items affecting the installation, to clearly identify the areas of conflict. This Contractor shall submit four (4) copies of the sketch, along with a written explanation of the problem and his proposed solution, to the Engineer for his review and determination on what action to take to resolve the conflict.

G. It shall be the duty of this Contractor to furnish full information to all Trades relative to the Work they are to do in connection with Work under this Section. This includes data for wiring, including wiring diagrams, equipment foundations, pipe connections, etc., furnished under other Sections.

F. Do not install any equipment or piping without first coordinating the installation with all other Trades. This Contractor must develop Coordination Drawings with all other Trades prior to installing any Systems.

3.03 AS-BUILT DRAWINGS

A. The Contractor shall reserve one set of Drawings for record purposes. From this set, the Contractor shall detach and furnish, at no charge to the Subcontractors, the Drawings of their portion of the Work for the same purpose.

B. The Contractor and the above Subcontractors shall keep their marked up As Built set on the site at all times and note on it in colored ink or pencil, neatly and accurately, at the end of each working day, the exact location of their Work as actually installed.

1. The location of all underground utilities and appurtenances, shall be referenced to permanent surface features, both horizontally and vertically at ten (10) foot intervals and at all changes of direction.

2. The location of all internal utilities, equipment, and appurtenances, including but not limited to piping, valves, cleanouts, strainers, traps, and maintenance devices:

a. shall be shown by offsets to structure and drawing grid lines.

b. The tolerance for the actual location of these items on the marked up As Built Drawings shall be plus or minus two (2) inches.

C. Use colored pencils for the following:

1. Red indicates deleted items.

2. Green reflects changes, additions, or new equipment.

3. Blue indicates specific info or details are provided.

D. Explain changes if necessary and use clear lettering. Notes and corrections are recommended. Use the same symbols, legend, and abbreviations as the original drawings.

E. Add Contractor’s name, date and clearly identify Drawings as “Red-Lined Drawings for As-Built preparation purposes only.

F. If no changes are needed to a specific drawing, state so and mark them as “As-Built”.

G. The As-Built Drawings shall be maintained in a clean, dry, and legible condition.

H. The As-Built Drawings shall be reviewed in the field by the Engineer during the construction process and prior to the related work being concealed. Concealment includes Work located above suspended acoustical tile ceilings. Ceiling tiles shall not be installed until the As-Built Drawings have been reviewed and approved by the Engineer.

I. Work which has been covered prior to the Engineer's review of the associated As-Built Drawings shall be exposed, and then concealed, only after the Engineer's review and approval, the cost of which shall be borne by the General Contractor.

J. The Engineer has a limited number of inspections in its Contract. The General Contractor and this Contractor should be aware of the quantity and possible frequency of these inspections and coordinate their Work accordingly. Additional inspections may be provided, the cost of which shall be borne by the General Contractor.

K Availability of As-Built Drawings shall be a prerequisite to scheduling an Engineer's inspection of this Work and said As-Built Drawings and Original Contract Documents will be used in checking completion of the Work.

L. Non-availability of As-Built Drawings or inaccuracies therein may be grounds for cancellation or postponement of any scheduled Engineer's inspection of the Work until such time as the availability or discrepancy has been corrected, and the General Contractor shall compensate the Engineer directly for their effort in association with the cancelled or postponed inspection.

M. Non-availability of or inaccuracies in As-Built Drawings are not grounds for claims of delays in the Work.

END OF SECTION