

SECTION 07272

FLUID-APPLIED MEMBRANE AIR BARRIERS, VAPOR PERMEABLE

Perm-A-Barrier® VPO Specifications

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Materials and installation methods for fluid-applied, vapor permeable air barrier membrane system located in the non-accessible part of the wall.
 - 2. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.
- B. Related Sections include the following:
 - 1. Section 03300 – Cast-In-Place Concrete
 - 2. Section 04810 – Unit Masonry Assemblies
 - 3. Section 06161 - Gypsum Sheathing
 - 4. Section 07115 – Bituminous Dampproofing
 - 5. Section 07131 – Self-Adhering Sheet Waterproofing
 - 6. Section 07530 – Elastomeric Membrane Roofing
 - 7. Section 07620 – Sheet Metal Flashing and Trim
 - 8. Section 07920 – Joint Sealants

1.03 DEFINITIONS

- A. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.04 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50% of the difference between the conditioned space and design ambient conditions. The air barrier shall have the following characteristics:

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1. It must be continuous, with all joints made airtight.
2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2178.
3. It shall have an air permeability not to exceed 0.04 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2357.
3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
4. It shall be durable or maintainable.
5. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
 - a. Foundation and walls
 - b. Walls and windows or doors
 - c. Different wall systems
 - d. Wall and roof
 - e. Wall and roof over unconditioned space
 - f. Walls, floor and roof across construction, control and expansion joints
 - g. Walls, floors and roof to utility, pipe and duct penetrations
6. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.05 REFERENCES

- A. The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.
- B. American Society for Testing and Materials (ASTM)
 1. ASTM C836 Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
 2. ASTM C1193 Guide for Use of Joint Sealants
 3. ASTM D412 Standard Test Methods for Rubber Properties in Tension
 4. ASTM D570 Test Method for Water Absorption of Plastics
 5. ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 6. ASTM D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
 7. ASTM D1876 Test Method for Peel Resistance of Adhesives
 8. ASTM D1938 Test Method for Tear Propagation Resistance of Plastic Film and Sheeting
 9. ASTM D1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 10. ASTM D4258 Practice for Surface Cleaning Concrete for Coating

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11. ASTM D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
12. ASTM D4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
13. ASTM E96 Test Methods for Water Vapor Transmission of Materials
14. ASTM E154 Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
15. ASTM E1186 Practice for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems
16. ASTM E2178 Standard Test Method for Air Permeance of Building Materials
17. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.06 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.
- B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 1. Include details of interfaces with other materials that form part of air barrier
 2. Include details of mockups
- C. Samples: Submit representative samples of the following for approval:
 1. Fluid-Applied membrane
 2. Self-Adhered Transition Membrane
 3. Self-Adhered Through Wall Flashing
- D. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.
- E. Qualification Data: For Applicator.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.
- G. Warranty: Submit a sample warranty identifying the terms and conditions stated in Article 1.10.

1.07 QUALITY ASSURANCE

- A. Manufacturer: Air barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing and air barriers. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.

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- B. Source Limitations: Obtain primary air-barrier material and through wall flashing through one source from a single manufacturer. Should project require a vapor permeable and a vapor impermeable air barrier on same project, obtain vapor-permeable and vapor impermeable air barrier and through wall flashing from one source from a single manufacturer. See specification Section 07270 for fully-adhered vapor impermeable air barrier.
- C. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- D. Mockups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.
 - 1. Coordinate construction of mockup to permit inspection by Owner's testing agency of air barrier before external insulation and cladding is installed
 - 2. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved
- E. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Preinstallation conference shall include the Contractor, installer, Architect, and system manufacturer's field representative. Agenda for meeting shall include but not be limited to the following:
 - 1. Review of submittals
 - 2. Review of surface preparation, minimum curing period and installation procedures
 - 3. Review of special details and flashings
 - 4. Sequence of construction, responsibilities and schedule for subsequent operations
 - 5. Review of mock-up requirements
 - 6. Review of inspection, testing, protection and repair procedures

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
- B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
- C. Protect fluid-applied membrane components from freezing and extreme heat.
- D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environ-

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mental conditions that affect performance of air barrier. Do not apply air barrier to a wet substrate or during snow, rain, fog, or mist.

1.10 WARRANTY

- A. Submit manufacturer's warranty that air barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.
- B. Warranty Period: Five years from date of completion of the air barrier membrane installation.

PART 2 PRODUCTS

2.01 FLUID-APPLIED, VAPOR PERMEABLE MEMBRANE AIR BARRIER

- A. FLUID-APPLIED AIR BARRIER MEMBRANE: Perm-A-Barrier® VPO, as manufactured by Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA; a fluid-applied, vapor permeable, acrylic membrane that provides continuous air tightness and water protection throughout the wall assembly. The membrane is dark-colored and designed for exposure to indirect and intermittent sunlight, such as behind open joint rain screen systems. Product shall have the following minimum physical properties:
 - 1. Membrane Air Permeance: ASTM E2178: Not to exceed 0.0004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.002 L/s. x sq. m. @ 75 Pa)
 - 2. Assembly Performance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.0008 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.004 L/s. x sq. m. of surface area at 75 Pa) when tested in accordance with ASTM E2357.
 - 3. Membrane Vapor Permeance: ASTM E96, Method B: 11.2 perms
 - 4. Peel Adhesion: ASTM D903: min. 5 pli or substrate failure to glass faced wall board, min. 20 pli to concrete/CMU
 - 5. Pull Adhesion: ASTM D4541: min. 50 psi or substrate failure to glass faced wall board, min. 200 psi to concrete/CMU
 - 6. Weather resistance: Maintain physical properties after 84 daily cycles of UV
 - 7. Neil Sealability: ASTM D1970: Pass
 - 8. Low temperature flexibility and crack bridging: ASTM C836: Pass at -15F (-26C)
 - 9. Color: Blackish green
- B. TRANSITION MEMBRANE: Perm-A-Barrier Detail Membrane manufactured by Grace Construction Product; a 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
 - 1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms (2.9 ng/Pa s. sq. m.) max.
 - 2. Air Permeance at 75 Pa (0.3 in. water) pressure difference: 0.0006 L/s. sq. m (0.00012 cfm/ sq. ft.) max.
 - 3. Puncture Resistance: ASTM E154: 178 N (40 lbs.) min.
 - 4. Lap Adhesion at -4°C (25°F): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
 - 5. Low Temperature Flexibility: ASTM D1970: Unaffected to -43°C (-45°F)
 - 6. Tensile Strength: ASTM D412, Die C Modified: min. 2.7 MPa (400 psi)

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7. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%
- C. FLEXIBLE MEMBRANE WALL FLASHING: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products; a 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms (2.9 ng/ Pa s. sq. m.) max.
 2. Water Absorption: ASTM D570: max. 0.1% by weight
 3. Puncture Resistance: ASTM E154: 356 N (80 lbs.) min.
 4. Tear Resistance
 - a. Initiation ASTM D1004: min. 58 N (13.0 lbs.) M.D.
 - b. Propagation ASTM D1938: min. 40 N (9.0 lbs.) M.D.
 5. Lap Adhesion at -4°C (25°F): ASTM D1876: 880 N/m (5.0 lbs./in.) of width
 6. Low Temperature Flexibility: ASTM D1970: Unaffected to -43°C (-45°F)
 7. Tensile Strength: ASTM D412, Die C Modified: min. 5.5 MPa (800 psi)
 8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%
- D. FLEXIBLE MEMBRANE ALUMINUM FLASHING: Perm-A-Barrier Aluminum flashing manufactured by Grace Construction Products; a 0.9 mm (35 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (5 mil) of aluminum film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:
1. Water Absorption: ASTM D570: max 0.1% by weight
 2. Puncture Resistance: ASTM E154: 355N (80 lbs) min.
 3. Lap Adhesion at -4°C (25°F): ASTM D1876 Modified: 880 N/m (5.0 lbs./in.) of width
 4. Low Temperature Flexibility: ASTM D1970 Modified: Unaffected to -26°C (-15°F)
 5. Tensile Strength: ASTM D412, Die C Modified: min. 4.1 MPa (600 Psi)
 6. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C Modified: min. 200%

2.02 PRIMERS

- A. Primer for Self-adhered air barrier membrane: Perm-A-Barrier Primer Plus manufactured by Grace Construction Products; a water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product shall have the following minimum physical properties:
1. Color: Milky White (wet), Clear (dry)
 2. Weight: 8.25 lbs./gal.
 3. Solids Content (by wt.): 53-57%
 4. Solvent Type: Water
 3. VOC Content: Not to excess 1 g/L
 4. Application Temperature: 4°C (40°F) and above

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- B. Wall Primer for Self-adhered transition membrane and Self-adhered flexible membrane wall flashing: Perm-A- Barrier WB Primer manufactured by Grace Construction Products; a water-based primer which imparts an aggressive, high tack finish on the treated substrate.
 - 1. Flash Point: No flash to boiling point
 - 2. VOC Content: Not to exceed 10 g/L
 - 3. Application Temperature: -4°C (25°F) and above
 - 4. Freezing point (as packaged): -7°C (21°F)

2.03 PENETRATIONS & TERMINATION SEALANT

- A. Liquid Membrane for Details and Terminations: Bituthene Liquid Membrane manufactured by Grace Construction Products; a two-part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L max. VOC content.
- B. Substrate Patching Membrane: Bituthene Liquid Membrane manufactured by Grace Construction Products; a two- part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L max. VOC content.
- C. Joint Sealant: Refer to sealant manufacturer's recommendations.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates and conditions are ready to accept the Work of this section. Notify architect in writing of any discrepancies. Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrates.
- B. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full-flush. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.

3.02 SURFACE PREPARATION

- A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier assembly.
- B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 50 – 75 mm (2-3 in.) wide, manufacturer's recommended mesh-style wallboard tape. Gaps greater than 6 mm (1/4 in.) should be filled with mastic or caulk, allowing sufficient time to fully cure before application of the mesh-style wallboard tape and fluid applied air barrier system.
- C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.
- D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

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- E. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
- F. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- G. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- H. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.
- I. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- J. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane at sharp corners and edges to form a smooth transition from one plane to another.
- K. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

- A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 before coating surfaces.
 - 1. Prime substrate as required.

3.04 AIR BARRIER MEMBRANE INSTALLATION

- A. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
- B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.
- C. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.
 - 1. Vapor-Permeable Membrane Air Barrier: 90-mil (2.4-mm) wet film thickness, 42~45-mil (1.2-mm) dry film thickness.
- D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.05 TRANSITION MEMBRANE INSTALLATION

- A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

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- B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Re-prime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- D. At end of each working day, seal top edge of strips and transition membrane to substrate with termination sealant.
- E. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.
 - 1. Transition Membrane: Roll firmly to enhance adhesion.
- G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.
- H. Repair punctures, voids, and deficient lapped seams in strips and transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.06 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:
 - 1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes
 - 2. Continuous structural support of air barrier system has been provided
 - 3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings
 - 4. Site conditions for application temperature and dryness of substrates have been maintained
 - 5. Maximum exposure time of materials to UV deterioration has not been exceeded
 - 6. Surfaces have been primed, if applicable
 - 7. Laps in strips and transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths
 - 8. Termination sealant has been applied on cut edges

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9. Strips and transition membrane have been firmly adhered to substrate
 10. Compatible materials have been used
 11. Transitions at changes in direction and structural support at gaps have been provided.
 12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal
 13. All penetrations have been sealed
- C. Tests: Testing to be performed will be determined by Owner's testing agency from among the following tests:
1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186.
- D. Remove and replace deficient air barrier components and retest as specified above.

3.07 CLEANING AND PROTECTION

- A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
- B. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace main air barrier material exposed for more than 180 days.
- C. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- D. Remove masking materials after installation.

END OF SECTION