SECTION 072726

# Fluid-applied membrane air barriers, vapor impermeable

Perm-A-Barrier® Liquid

PART 1 — GENERAL

1.01 RELATED DOCUMENTS

 A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 SUMMARY

 A. The work of this section includes, but is not limited to, the following:

1. Materials and installation methods for fluid applied air and vapor 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: Other specification sections that directly relate to the works of this section include, but are not limited to, the following:

1. Section 033000 – Cast-In-Place Concrete
2. Section 042000 – Unit Masonry
3. Section 061643 - Gypsum Sheathing
4. Section 071113 – Bituminous Dampproofing
5. Section 071325 – Self-Adhering Sheet Waterproofing
6. Section 075300 – Elastomeric Membrane Roofing
7. Section 076200 – Sheet Metal Flashing and Trim
8. Section 079200 – Joint Sealants

1.03 PERFORMANCE REQUIREMENTS

1. Provide an air and vapor barrier system to perform as a continuous barrier to air infiltration/exfiltration and water vapor transmission and to act as a liquid water drainage plane flashed to discharge any incidental condensation or water penetration.

 NOTE TO SPECIFIER: Delete or insert local energy code requirements below where relevant

1. Commonwealth of Massachusetts Building Code Requirements: The intent of this specification is to require compliance with 780 CMR 13, Section 1304.3 Air Leakage.

 1304.3.1 Air Barriers:

 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:

1. It must be continuous, with all joints made airtight.
2. It shall have an air permeability not to exceed 0.004 cfm/ft2 under a pressure differential of 0.3 in. water. (1.57 psf.) (equal to 0.02L/s/m2 @ 75 Pa.).
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.

 1304.3.2 Air barrier penetrations:

 All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

* 1. REFERENCES
1. 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.
2. American Society for Testing and Materials (ASTM)
3. C 836 Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
4. D 412 Standard Test Methods for Rubber Properties in Tension
5. D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
6. D 1644 Test Methods for Non-volatile Content of Varnishes
7. D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
8. D 4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
9. D 3767 Standard Practice for Rubber - Measurements of Dimensions
10. E 96 Test Methods for Water Vapor Transmission of Materials
11. E 283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
12. E 2178 Standard Test Method for Air Permeance of Building Materials
13. E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
	1. SUBMITTALS
14. Product Data: Submit manufacturer’s product data, installation instructions, use limitations and substrate preparation recommendations.
15. Shop drawings showing locations and extent of air and vapor barrier system including details for terminations flashings, penetrations, window and door openings and treatment of substrate joints and cracks.
16. Written documentation demonstrating installers qualifications under the "Quality Assurance" article including reference projects of a similar scope.
17. Samples: Submit representative samples of the following for approval:
18. Fluid applied air barrier membrane
19. Transition Membrane
20. Through Wall Flashing
21. Warranty: Submit a sample warranty identifying the terms and conditions stated in Section 1.09.
	1. QUALITY ASSURANCE
22. Manufacturer: Air and vapor 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 barrier products. 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.
23. Installer: The installer shall demonstrate qualifications to perform the work of this Section by submitting the following:
24. List of at least three (3) projects contracted within the past five (5) years of similar scope and complexity to this project carried out by the firm and site supervisor.
25. Installer must show evidence of adequate equipment and trained field personnel to successfully complete the project in a timely manner.
26. Materials: Fluid applied air and vapor barrier material shall be two part synthetic rubber based systems free of solvents, isocyanates and bitumen. For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.
27. 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. Agenda for meeting shall include but not be limited to the following:
28. Review of submittals.
29. Review of surface preparation, minimum curing period and installation procedures.
30. Review of special details and flashings.
31. Sequence of construction, responsibilities and schedule for subsequent operations.
32. Review of mock-up requirements.
33. Review of inspection, testing, protection and repair procedures.
34. Mock-up:
35. Prior to installation of the air and vapor barrier system a field-constructed mock-up shall be provided under the provisions of Section [01340 – Shop Drawings, Product Data, Samples and Mock-ups] to verify details and tie-ins and to demonstrate the required quality of materials and installation.
36. Construct a typical exterior wall section, 8 feet long and 8 feet wide, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing and any other critical junction (roof, foundation, etc).
37. Allow 24 hours for inspection and testing of mock-up before proceeding with air and vapor barrier work.
38. Mock-up may remain as part of the work.
39. Inspection and Testing: Cooperate and coordinate with the Owner’s inspection and testing agency. Do not cover any installed air and vapor barrier membrane until it has been inspected, tested and approved.

1.07 DELIVERY, STORAGE AND HANDLING

1. 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.
2. 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.
3. Protect fluid-applied membrane components from freezing and extreme heat.
4. Sequence deliveries to avoid delays, but minimize on-site storage.
	1. PROJECT CONDITIONS
5. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive the air and vapor barrier membrane.
	1. WARRANTY
6. Submit manufacturer's warranty that air and vapor barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.
7. Warranty Period: Five years from date of completion of the air barrier membrane installation.

### PART 2 — PRODUCTS

2.01 GENERAL

 For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.

2.02 FLUID APPLIED MEMBRANES

1. Description: a two part, self-curing, synthetic rubber based material free of solvents, isocyanates and bitumen
2. Performance Requirements:

|  |  |  |
| --- | --- | --- |
| Property | Test Method | Typical Value |
| Color |  | Green |
| Cured Film Thickness | ASTM D 3767 Method A | 60 mils (1.5 mm) nominal |
| Solids Content | ASTM D 1644 | 100% |
| Air Permeance at 75Pa (0.3 in. water) Differential Pressure | ASTM E 2178 | <0.001 L/(s.m2)(<0.0002 cfm/ft2) |
| Assembly Air Permeance at 75Pa (0.3 in. water) Differential Pressure | ASTM E 2357 | <0.004 L/s\*m2(<0.0008 cfm/ft2) |
| Water Vapor Permeance | ASTM E 96, Method BW | Less than 4.6 ng/Pa.s.m2(0.08 Perms) |
| Pull Adhesion to Concrete Block (CMU) | ASTM D 4541-02 | 0.24 N/mm² (35 psi) |
| Pull Adhesion to Glass Faced Wall Board | ASTM D 4541-02 | 0.12 N/mm² (18 psi) |
| Peel Adhesion to Concrete | ASTM D 903 Modified1 | 880 N/m (5 lb./in.) |
| Elongation | ASTM D 412 | 500% minimum |
| Pliability, 180° Bend over 25 mm (1 in.) Mandrel at -30°C (-23°F) | ASTM D 1970 | Unaffected |
| Low Temperature Flexibility and Crack Bridging3.2mm (1/8in.) crack cycling at –26°C (-15°F) | ASTM C836 | Pass |
| Extensibility over 6.4mm (1/4in.) crack after heat aging | ASTM C836 | Pass |

***Footnote:***

*1.The membrane is applied to concrete and allowed to cure. Peel adhesion of the membrane is measured at a rate of 50 mm (2 in.) per minute with a peel angle of 90° at room temperature.*

1. Acceptable Materials:

 Perm-A-Barrier ® Liquid from GCP Advanced Technologies Construction Products, 62 Whittemore Avenue, Cambridge, MA.

* 1. TRANSITION MEMBRANE
1. Description: 36 mil (0.9 mm) of self-adhesive rubberized asphalt integrally bonded to 4 mil (0.1 mm)of cross-laminated, high-density polyethylene film to provide a min. 40 mil (0.1 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
2. Performance Requirements:
3. Water Vapor Transmission: ASTM E 96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
4. Air Permeance at 75Pa (0.3 in. water) pressure difference: 0.0006 L/(s.m2) (0.00012 cfm/ft2)

 max.

1. Puncture Resistance, ASTM E 154: 178 N (40 lbs.) min.
2. Lap Adhesion at –4°C (25°F), ASTM D 1876: 880 N/m (5.0 lbs./in.) of width
3. Low Temperature Flexibility, ASTM D 1970: Unaffected to –43°C (-45°F).
4. Tensile Strength, ASTM D 412, Die C Modified: min. 2.7 MPa (400 psi)
5. Elongation, Ultimate Failure of Rubberized Asphalt, min. 200%

ASTM D 412 Die C:

1. Acceptable Materials:

 Perm-A-Barrier Detail Membrane manufactured by GCP Advanced Technologies Construction Products.

* 1. TRANSITION ALUMINUM MEMBRANE
1. Description: 35 mil (0.9 mm) of self-adhesive rubberized asphalt integrally bonded to 5 mil (0.1 mm)of aluminum film to provide a min. 40 mil (1.0 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
2. Performance Requirements:
	1. Water Absorption, ASTM D570: max 0.1% by weight
	2. Puncture Resistance, ASTM E154: 355N (80 lbs) min.
	3. Lap Adhesion at -4ºC (25ºF), ASTM D1876 Modified: 880 N/m (5.0 lbs./in.) of width
	4. Low Temperature Flexibility, ASTM D1970 Modified: Unaffected to -26ºC (-15ºF)
	5. Tensile Strength, ASTM D412, Die C Modified: min. 4.1 MPa (600 Psi)
	6. Elongation, Ultimate Failure of Rubberized Asphalt, min. 200%

 ASTM D412, Die C Modified:

1. Acceptable Materials:

 Perm-A-Barrier Aluminum Flashing manufactured by GCP Advanced Technologies Construction Products.

* 1. FLEXIBLE MEMBRANE THROUGH-WALL FLASHING
1. Description: 32 mil (0.8 mm)of self-adhesive rubberized asphalt integrally bonded to 8 mil (0.2 mm) of cross-laminated, high-density polyethylene film to provide a min. 40 mil (1.0 mm) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
2. Performance Requirements:
3. Water Vapor Transmission, ASTM E 96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
4. Water Absorption, ASTM D 570: max. 0.1% by weight
5. Puncture Resistance, ASTM E 154: 356 N (80 lbs.) min.
6. Tear Resistance

 a. Initiation, ASTM D 1004: min. 58 N (13.0 lbs.) M.D.

 b. Propagation, ASTM D 1938: min. 40 N (9.0 lbs.) M.D.

1. Lap Adhesion at -4ºC (25ºF), ASTM D 1876: 880 N/m (5.0 lbs./in.) of width
2. Low Temperature Flexibility, ASTM D 1970: Unaffected to -43ºC (-45ºF)
3. Tensile Strength, ASTM D 412, Die C Modified: min. 5.5 MPa (800 psi)
4. Elongation, Ultimate Failure of Rubberized Asphalt, min. 200%

ASTM D412, Die C:

1. Acceptable Materials:

 Perm-A-Barrier Wall Flashing manufactured by GCP Advanced Technologies Construction Products.

[Spec. Note: Perm-A-Barrier Aluminum Flashing is not to be used when materials that could cause corrosion of aluminum, such as stucco, are to be in direct contact with the aluminum facing of the Perm-A-Barrier Aluminum Flashing]

* 1. AIR & VAPOR BARRIER ACCESSORIES
1. Description: Water-based primer which imparts an aggressive, high tack finish on the treated substrate
2. Flash Point: No flash to boiling point
3. Solvent Type: Water
4. VOC Content: Not to exceed 10 g/l
5. Application Temperature: -4°C (25°F) and above
6. Freezing point (as packaged): -7°C (21°F)

 Product: Perm-A-BarrierWB Primer manufactured by GCP Advanced Technologies Construction Products.

1. Description: Two part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/l max. VOC Content.

 Product: Bituthene® Liquid Membrane manufactured by GCP Advanced Technologies Construction Products.

1. Optional Primers:
2. Description : Water-based primer which imparts an aggressive, high tack finish on the treated substrate. 1 g/l max. VOC Content.

 Product : Perm-A-Barrier Primer Plus manufactured by GCP Advanced Technologies Construction Products.

1. Description: High tack water based primer. 10 g/l max. VOC content.

 Product: Perm-A-Barrier Liquid Part B manufactured by GCP Advanced Technologies Construction Products.

1. Description: High tack low VOC solvent based primer. <200 g/l max. VOC content.

 Product: Bituthene Primer B2 LVC manufactured by GCP Advanced Technologies Construction Products.

1. Description: High tack solvent based primer. 440 g/l max. VOC content.

 Product: Bituthene Primer B2 manufactured by GCP Advanced Technologies Construction Products.

1. Description: One part neutral curing, ultra low modulus silicone sealant that reacts with atmospheric moisture to form a durable and flexible building sealant. 98 g/L. VOC content.

Product: S100 Sealant.

PART 3 — EXECUTION

3.01 EXAMINATION

1. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 PREPARATION

1. Refer to manufacturer’s literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, lose 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 waterproofing.
2. 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 - 75mm (2-3 in.) wide, reinforced self-adhesive tape or fiberglass mesh style wallboard tape. Gaps greater than 6mm (1/4 in.) should be filled with a compatible sealant, allowing sufficient time to fully cure before application of the tape and fluid applied membrane. Alternatively or for high temperature applications, anticipated extended exposure and/or high wind loads use S100 Sealant as the sheathing panel joint treatment. Completely fill the sheathing joint with S100 Sealant and then install a scratch coat (15-30-mils) of S100 Sealant with a margin trowel or similar approximately 25 mm (1 in,) on each side of the sheathing joint, ensuring the edges are tapered to prevent shadowing of the spray application . Once the S100 Sealant is tack free, the fluid applied membrane can be installed.
3. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth flush mortar joints. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.
4. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

3.03 INSTALLATION

A. Refer to manufacturer’s literature for recommendations on installation

B. Application of Fluid Applied Membrane

1. Spray or trowel apply a continuous uniform film at min. 60 mil (1.5 mm or .060 in.) dry film thickness using multiple, overlapping passes.
2. When spraying use a cross-hatching technique (alternating horizontal and vertical passes) to ensure even thickness and coverage.
3. When spraying use high pressure, multi-component, airless spray equipment approved by material manufacturer.
4. Carry membrane into any openings a minimum of 50mm (2 in.).
5. Seal all brick-ties and other penetrations as work progresses.

C. Application of Transition Membrane

1. After allowing the Fluid Applied Membrane to cure to tack-free, apply transition membrane with a minimum overlap of 75mm (3 in.) onto each surface at all beams, columns and joints as indicated in detail drawings.
2. Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
3. Use pre-cut, easily handled lengths for each location.
4. Remove silicone-coated release paper and position membrane flashing carefully before placing it against the surface.
5. When properly positioned, place against surface by pressing firmly into place by hand roller.
6. Overlap adjacent pieces 50 mm (2 in.) and roll all seams with a hand roller.
7. Seal top edge of flashing with sealant. .
8. When transition flashing is pre-installed prior to application of Fluid Applied Membrane, apply transition flashing as above. Spray or trowel a continuous uniform film of Fluid Membrane at min. 60 mil (1.5 mm or .060 in.) dry film thickness using multiple, overlapping passes, with a minimum overlap of 75 mm (3 in.) onto transition flashing. For sill condition, spray or trowel Fluid Membrane onto pre-installed sill flashing and onto horizontal section of sill.

D. Application of Flexible Membrane Wall Flashing

1. Precut pieces of flashing to easily handled lengths for each location.
2. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
3. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
4. Overlap adjacent pieces 50 mm (2 in.) and roll all seams with a hand roller.
5. Trim bottom edge 13 mm (1/2 in.) back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
6. At heads, sills and all flashing terminations, turn up ends a minimum of 50 mm (2 in.) and make careful folds to form an end dam, with the seams sealed.
7. Seal top edge of flashing with termination mastic.
8. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with poly-sulfide sealants, creosote, uncured coal tar products or EPDM.
	1. PROTECTION AND CLEANING
9. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.
10. Perm-A-Barrier Liquid is not suitable for permanent exposure and should be protected from the effects of sunlight.
11. Schedule work to ensure that the Perm-A-Barrier Liquid system is covered as soon as possible after installation. Protect Perm-A-Barrier Liquid system from damage during subsequent operations. If the Perm-A-Barrier Liquid system cannot be covered within 60 days after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.