

SECTION 07264

SPRAY POLURETHANE FOAM INSULATION AND AIR/VAPOR BARRIER SYSTEM

PART 1 - GENERAL

SECTION INCLUDES

This section includes the following:

1. Materials and installation methods for a spray polyurethane foam building insulation and air/vapor barrier system located in the non-accessible part of the wall.
2. SRAB (sheet rubberized-asphalt barrier) self-adhered air/vapor barrier membrane in roof assemblies.
3. Materials and installation to bridge and seal the following air leakage pathways and gaps:
 - a. Connections of the walls to the roof air barrier.
 - b. Connections of the walls to the foundations.
 - c. Seismic and expansion joints.
 - d. Openings and penetrations of window frames, store front, curtain wall.
 - e. Barrier precast concrete and other envelope systems.
 - f. Door frames.
 - g. Piping, conduit, duct and similar penetrations
 - h. Masonry ties, screws, bolts and similar penetrations.
 - i. All other air leakage pathways in the building envelope.
4. Materials to act as flashings and counterflashings.

RELATED SECTIONS

Section 03300 - Cast-In-Place Concrete

Section 04200 - Unit Masonry

Section 07131 - Self-Adhering Sheet Waterproofing

Section 07160 - Bituminous Dampproofing: Below grade dampproofing.

Section 07210 - Building Insulation

Section 07530 - Single-Ply Membrane Roofing

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Section 07620 - Sheet Metal Flashing and Trim

Section 07900 - Joint Sealers: Joint sealant materials and installation.

PERFORMANCE REQUIREMENTS

Provide air/vapor barrier system constructed to perform as a continuous air/vapor barrier system, as building thermal insulation, and as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. System shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air seal materials at such locations, changes in substrate and perimeter conditions.

Commonwealth of Massachusetts Building Code Requirements: The intent of this specification is to require compliance with 780 CMR 13, including all the insulation requirements of Chapter 13, Section 1304.1.2 Moisture Control and 1304.3 Air Leakage.

5. Code 780 CMR 1304.1.2 Moisture Control:
 - a. A vapor barrier having a maximum permeability of zero point one (0.1) perm or less (equivalent to a 4 mil polyethylene sheet) shall be installed on the winter warm side of walls, ceilings and floors enclosing a conditioned space. All joints, holes, imperfections and penetrations of the vapor barrier shall be taped tight with a vapor barrier tape recommended by the vapor barrier manufacturer.
 - 1) Exception 3: Envelope systems that maintain the moisture content of all building materials that comprise the assembly, below the equilibrium moisture content the materials would achieve when exposed to relative humidity of 80%. For calculation purposes use Chapter 22 in 1997 ASHRAE Fundamentals Handbook, "Mathematical Models". Assume interior air temperature and humidity specified in 1303.3.
6. Code 780 CMR 1304.3.1 Air Barriers: "The building envelope shall be...constructed with a continuous air barrier to control air leakage into, or out of the conditioned space." "The air barrier shall have the following characteristics:
 - a. It must be continuous, with all joints made air-tight.
 - b. It (the material used) shall have an air permeability not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf) (0.02 L/s.m² @ 75 Pa.) when tested in accordance with ASTM E2178-01
 - c. 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." "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:

- 1) Foundation and walls.
 - 2) Walls and windows or doors.
 - 3) Different wall systems.
 - 4) Wall and roof.
 - 5) Wall and roof over unconditioned space.
 - 6) Walls, floor and roof across construction, control and expansion joints.
 - 7) Walls, floors and roof to utility, pipe and duct penetrations. “
7. Code 780 CMR 1304.3.2, Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration / exfiltration shall be made air-tight.

Provide a tested system in accordance with the Air Barrier Association of America’s (ABAA’s) testing protocol, to provide tested system air leakage results not to exceed:

1. 0.01 cfm/sf @ 1.57 psf (0.05 L/s/M2 @ 75 Pa)

SUBMITTALS

Provide submittals in accordance with Section 01300.

1. At bid submission, provide evidence to the Architect of licensing and certification under the Air Barrier Association of America’s (ABAA’s) Quality Assurance Program.
2. Submit shop drawings showing locations and extent of air/vapor barrier and details of all typical conditions, intersections with other envelope systems and materials, membrane flashings and counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.
3. Submit manufacturer's product data sheets for each type of material, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.
4. Submit manufacturer's installation instructions.
5. Provide evidence of testing by an accredited laboratory confirming material has been tested and conforms to the requirements of ASTM E2178, Standard for Air Barrier Materials.
6. Certification by air/vapor barrier manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
7. Certification of compatibility by air/vapor barrier manufacturer, listing all materials on the project that it connects to or that come in contact with it.
8. Submit two samples, 12 by 12 inch (300 by 300 mm) minimum size, of each air/vapor barrier material required for Project.
9. Submit test results of air permeability testing of primary air barrier material (ASTM E 2178-01)

10. Submit test results of assembly in accordance with ABAA test protocol.

QUALITY ASSURANCE

Installer Qualifications:

1. The air barrier contractor shall be, during the bidding period as well as for the duration of the installation, officially recognized as a Licensed Contractor by the Air Barrier Association of America (ABAA). The contractor shall carry liability insurance and bonding.
2. Each worker who is installing air barriers must be either a Certified Applicator or an installer who is registered with ABAA
3. Each Lead Certified Applicator can supervise a maximum of five registered installers. The Certified Applicator shall be thoroughly trained and experienced in the installation of air barriers of the types being applied. Lead Certified Applicators shall perform or directly supervise all air/vapor barrier work on the project.
4. Air/vapor barrier installers must be trained and certified by ABAA/NECA (National Energy Conservation Association) and PSDI (Professional Skills Development Institute for energy conservation) in accordance with the training requirements outlined in the ULC S705.2-02 Installation Standard. Installers shall have their photo-identification certification cards in their possession and available on the project site, for inspection upon request.

Single-Source Responsibility: Obtain air/vapor barrier materials from a single manufacturer regularly engaged in manufacturing the product.

Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

Preconstruction Meeting: Convene two weeks prior to commencing Work of this section, in accordance with Section 01200 - Project Meetings.

Field-Constructed Mock-Ups: Prior to installation of air/vapor barrier, apply air/vapor barrier as follows to verify details under shop drawing submittals and to demonstrate tie-ins with adjoining construction, and other termination conditions, as well as qualities of materials and execution:

1. Apply air/vapor barrier in field-constructed mock-ups of assemblies specified in Section 04200 and Section 09253.
2. Apply air/vapor barrier in field-constructed mock-ups of assemblies specified in Section 01452, "Mock-Ups".
3. Construct typical exterior wall panel, 8 feet long by 8 feet wide, incorporating back-up wall, partial cladding, window and doorframe and sill, insulation, flashing, [building corner condition,] [junction with roof system] [foundation wall] [and] [typical penetrations and gaps]; illustrating

materials interface and seals. All transition membranes and seals shall be installed per the manufacturer's system requirements.

Test mock-up for air and water infiltration to conform with Section 01400 - Quality Control, in accordance with ASTM E 783 and ASTM E1105.

Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed air and vapor barrier unless it has been inspected, tested and approved.

Protect people and materials from over-spray and contact with chemicals and gases.

DELIVERY, STORAGE, AND HANDLING

Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, expiration date, and directions for storage.

Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air/vapor barrier manufacturer. Protect stored materials from direct sunlight.

Avoid spillage. Immediately notify Owner, [Architect] [Consultant] if spillage occurs and start clean up procedures.

Clean spills and leave area as it was prior to spill.

WASTE MANAGEMENT AND DISPOSAL

Separate and recycle waste materials in accordance with Section [01355 - Waste Management and Disposal], and with the Waste Reduction Workplan.

Place materials defined as hazardous or toxic waste in designated containers.

Ensure emptied containers are sealed and stored safely for disposal away from children.

PROJECT CONDITIONS

Environmental Conditions: Apply air/vapor barrier within range of ambient and substrate temperatures recommended by air/vapor barrier manufacturer. Do not apply air/vapor barrier to a damp or wet substrate, unless the manufacturer specifically permits that for the product.

1. Do not apply air/vapor barrier in snow, rain, fog, or mist.

2. Do not apply air/vapor barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.
3. The product shall not be installed after the expiration date printed on the label of each container.

WARRANTY

Material Warranty: Provide the manufacturer's one year air/vapor barrier material warranty.

PART 2 - PRODUCTS

MATERIALS & MANUFACTURERS

1. Sprayed polyurethane foam material, when tested, shall meet the requirements of ULC S705.1-01 Standard for Thermal Insulation-Spray Applied Rigid Polyurethane Foam, Medium Density, Material-Specification.
2. A copy of an Evaluation Report (such as the CCMC Evaluation Report) or copies of the test reports from an accredited testing laboratory, for each physical property, indicating that the product meets the requirements of ULC S705.1-01 shall be made available upon request. A copy of either the evaluation report or the test reports shall be on file at the ABAA office.
3. Material containers shall be labeled with the Evaluation Report number of the evaluation agency.
4. Design R value as indicated in test report; minimum R6/inch.
5. Density as indicated in test report: 1.9 pounds per cubic foot.
6. Smoke development as indicated in test report; less than 500 when tested under ULC S102.
7. Products that meet the preceding requirements:
 - a. Walltite® by BASF

AUXILIARY MATERIALS

Furnish auxiliary materials recommended by air/vapor barrier manufacturer for intended use and compatible with the air/vapor barrier.

Transition and Detailing Membrane: Self-adhering, smooth surfaced SBS modified bitumen membrane, nominal 40 mil thickness, width as required.

1. Air-Shield™ by W. R. Meadows, Inc.

Transition and Detailing Membrane Primer:

1. Air-Shield LM by W. R. Meadows, Inc.
2. Mel-Prime VOC by W. R. Meadows, Inc.

Sheet Membrane Transition Strip Termination Sealant:

1. Pointing Mastic by W. R. Meadows, Inc.

Air Barrier Perimeter Seal Accessory Material to Windows, Doors, Curtainwall and Storefront systems:

1. Jamflash® by Lennel Specialties Corporation 294 Pleasant Street Suite 102 Stoughton, MA 02072 (781) 344-9794.
2. 16 oz lead coated copper

Sealant Seal Material For Accessory Material to Windows, Doors Curtainwall and Storefront Systems:

Provide sealants in accordance with Section 07900 - Joint Sealers. Comply with ASTM C920 and ASTM C920 classifications for type, grade, class, and uses

1. Silicone Sealant: Natural cure, low modulus, to seal sheet membrane flashing to polyethylene face of sheet rubberized-asphalt barrier and to seal between and to non-bituminous sheet systems.
 - a. Acceptable materials:
 - 1) Bondaflex Sil 290
 - 2) Dow 790
 - 3) Pecora 864
 - b. SPF (Sprayed Polyurethane Foam) Sealant: Provide one- or two-component, foamed-in-place, polyurethane foam sealant with the following characteristics:
 - 1) Density: 1.5 to 2.0 PCF.
 - 2) Flame Spread (ASTM E162): 25 or less.
 - 3) Initial R-Value (at 1 inch): Not less than 7.Acceptable materials:
 - a) Zerodraft Foam Sealant by BASF
2. Substrate Cleaner: Non-corrosive as recommended by sealant manufacturer. Compatible with adjacent materials,

Sheet Membrane Air Barrier Perimeter Seal to Windows, Doors, Curtainwall and Storefront systems: Low modulus silicone sheet; provide manufacturer's standard system consisting of precured low-modulus silicone extrusion, in sizes to fit widths indicated, combined with a neutral-curing low modulus silicone sealant for bonding extrusions to substrates.

1. Bondaflex Silbridge 300 by May National Associates, Inc.
2. Dow 1-2-3.
3. Sil-Span by Pecora Corporation

EQUIPMENT

1. The equipment used to spray the polyurethane foam material shall be in accordance with ULC S705.2-02 and the equipment manufacturer's recommendations for specific type of application.
2. Equipment settings are to be recorded on the Daily Work Record as required by the ULC S705.2-02 Installation standard.
3. Each proportioner unit to supply only one spray gun.

PART 3 - EXECUTION

EXAMINATION

Examine substrates, areas, and conditions under which air/vapor barrier systems will be applied, with Installer present, for compliance with requirements. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Do not proceed with installation until after minimum concrete curing period recommended by air/vapor barrier manufacturer.
2. Ensure that:
 - a. surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants
 - b. concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
 - c. masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.
3. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
4. Notify Architect in writing of anticipated problems using air/vapor barrier over substrate.

SURFACE PREPARATION

Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air/vapor barrier application.

Prime masonry, concrete substrates with conditioning primer when installing modified asphalt membrane transition membranes.

Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond to transition membranes, with adequate drying time between coats.

Prime wood, metal, and painted substrates with primer recommended by membrane manufacturer.

Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air/vapor barrier and at protrusions according to air/vapor barrier manufacturer's written instructions [and approved tested system in accordance with ABAA air barrier testing protocol].

1. Verify that surfaces and conditions are suitable to accept work as outlined in this section.
2. Prior to commencement of work report in writing to the architect [consultant] any defects in surfaces or conditions that may adversely affect the performance of products installed under this section.
3. Commencement of work outlined in this section shall be deemed as acceptance of existing work and conditions.
4. Examine joints before sealing to ensure configurations, surfaces and widths are suitable for spray polyurethane foam. Report in writing all defects stating the locations of joints deemed unacceptable for the application of the spray polyurethane foam.

PREPARATION

Protection:

1. Mask and cover adjacent areas to protect from over spray.
2. Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
3. Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes. Provide for make-up air.
4. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

Surface Preparation

1. Surfaces to receive foam insulation shall be clean, dry and properly fastened to ensure adhesion of the polyurethane foam to the substrate.
2. Ensure that all work by other trades that may penetrate through the air barrier system is in place and complete.
3. Ensure that surface preparation and any primers required conform to the manufacturers instructions.
5. Prepare surfaces by brushing, scrubbing. Scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion and integrity of the spray polyurethane foam. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the spray polyurethane foam. Ensure surfaces are dry before proceeding.

6. Install transition membranes to all applicable surfaces and ensure proper adhesion of the transition membranes to the substrate, capable of having spray polyurethane foam insulation.
7. Install accessory materials at windows, doors, curtainwall and storefronts.
 - a. Jamflash® and 16 oz lead coated copper: Mechanically fasten accessory materials with screws at 12" o.c.
 - b. Membrane: Cut into and uncover only 3" of siliconized release paper along one edge of the counter-flashing membrane. Adhere membrane flashing to the pre-primed substrate a minimum of 3" and roll firmly in place.
8. Ensure veneer anchors are in place.

APPLICATION:

1. Spray-application of polyurethane foam shall be installed in accordance with ULC S705.2-02 and the manufacturers instructions.
2. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer and the ULC S705.2 Installation standard.
3. Apply in consecutive passes as recommended by manufacturer to thickness as indicated on drawings. Passes shall be not less than inch and not greater than 2 inches.
4. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.
5. Finished surface of foam insulation to be free of voids and embedded foreign objects.
6. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.
7. Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.
8. Clean and restore surfaces soiled or damaged by work of the section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.
9. Do not permit adjacent work to be damaged by work of this section. Damage to work of this section caused by other sections shall be repaired by this section at the expense of the subcontractor causing the damage.
10. Complete connections to other components or repair any gaps, holes or other damage using material which conforms to ULC S710.1 Polyurethane Sealant Foam – One Component – Material or ULC S711.1 Polyurethane Sealant Foam – Two Components – Material and shall be installed in accordance with ULC S710.2 Polyurethane Sealant Foam – One component – Installation or ULC S711.2 Polyurethane Sealant Foam – Two Component – Installation, whichever is appropriate.

Field Quality Control

Site Tests

1. The Licensed Installer shall conduct daily visual inspection, adhesion/cohesion testing and density measurements as outlined by the ULC S705.2-02 Installation standard.
2. The Licensed Installer shall complete the Daily Work Record and record all information required including the results of the testing. The Daily Work Record shall be kept on site for routine inspection. Copies of the Daily Work Record shall be forwarded to the owner or owner's representative upon request. Copies of the Daily Work Record or monthly summaries shall be sent to the ABAA office on a monthly basis as required by the Quality Assurance Program.
3. Transition membranes shall be pull tested in accordance with the ABAA Quality Assurance Program requirements before installing the spray polyurethane air barrier material.
4. The costs incurred for daily testing and inspection by the Licensed Installer and the completion of the Daily Work Record shall be borne by the Licensed Contractor.

Inspection

1. Arrange for site inspections by ABAA. The cost of inspections shall be included in the bid provided by the Licensed Contractor.
2. The ABAA site-inspections shall verify conformance with the manufacturers instructions, the standard ULC S705.2-02 Installation standard, the ABAA Quality Assurance Program, and this section of the project specification.
3. Inspections and testing shall be carried out at 5%, 50% and 95% of completion. A written inspection report shall be forwarded to the architect [the owner's representative] [the Contractor] and the ABAA-licensed installer within 3 working days of the inspection and test being performed. In the case of any deficiencies, the ABAA-licensed inspector may verbally advise the licensed installer at the time of the inspection.
4. If the inspection reveals any defects, the Licensed Contractor shall immediately rectify all such defects at his cost.

TOLERANCES

1. Maximum variation from indicated thickness: minus (-) 1/2 inch; plus (+) 1/2 inch.

PROTECTION

1. Protect the spray polyurethane foam from ultraviolet radiation when installed on the exterior of a building.
2. Cover the spray polyurethane foam with a thermal barrier when installed on the interior of the building.

END OF SECTION