

SECTION 07 21 10 - SPRAYED APPLIED FOAM CAVITY INSULATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Sprayed polyurethane foam insulation for thermal performance and air barriers. Section includes the following:
 - 1. Materials and insulation methods for a sprayed polyurethane foam building insulation and air barrier system located in the non-accessible part of wall.
 - 2. Materials and insulation to bridge and seal the following air leakage pathways and gaps to prevent nonconditioned air from filtering into interior building spaces.
 - a. Gaps between walls and roof
 - b. Expansion joints
 - c. Openings and penetrations of window frames, storefront, and curtain wall.
 - d. Piping, conduit, duct, and similar penetrations in the exterior envelope.
 - e. Masonry ties, screws, bolts, and similar penetrations.
 - f. Miscellaneous air leakage pathways in the building envelope.
- B. Not Used

1.2 DEFINITIONS

- A. ABAA: Air Barrier Association of America
- B. 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 wall.

1.3 SYSTEM DESCRIPTION

- A. Provide air barrier system constructed to perform as a continuous air 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.
 - 1. Air leakage shall not exceed .01 cfm/sf at 1.57 psf.

1.4 SUBMITTALS

- A. Shop Drawings: Show 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, electrical boxes, and the like are sealed.
- B. Quality Assurance/Control Submittals:
 - 1. Product Data: For materials proposed and application instructions for evaluating, preparing, and treating substrate, temperature, and other limitations of insulation conditions.
 - a. Provide data on materials, describing insulation properties and surface burning characteristics.
 - b. Manufacturer's insulation instructions indicating special procedures and perimeter conditions requiring special treatments.
 - 2. Certify material has been tested and conforms to the requirements of ASTM E 2178, Standard for Air Barrier Materials.
 - 3. Qualification Data: For installers.
- C. Additional submittals
 - 1. Credit MR4.1; Recycled Content: Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content.
 - 2. Credit MR5.1; Local/Regional Materials:
 - a. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the potential site.
 - b. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.

1.5 QUALITY ASSURANCE

- A. Qualifications of Applicators: manufacturer shall perform application or an applicator certified by the manufacture as being fully qualified by experience and training, and as having the proper equipment to satisfactorily complete this installation in strict accordance with the manufacturer's instructions and these Specifications.
- B. Regulatory Requirements: Comply with ASTM E84/UL 723, tested at a minimum of 5 inch thickness, Class A.
 - 1. Flame Spread: Less than 25.
 - 2. Smoke Development: Less than 450.
- C. Field-Constructed Mock-Ups: Prior to installation of 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.

- D.
 - 1. Apply air barrier in field-constructed mock-ups of assemblies specified in Section 04810 – Unit Masonry.
- E. Cooperate and coordinate with the inspection and testing agency.
- F. Protect people and materials from over-spray and contact with chemicals and gases.
- G. Pre-installation Conference: Conduct conference at project site.
 - 1. Include installers of other construction connecting to air barriers, including roofing, waterproofing, masonry, sealants, windows and door frames.
 - 2. Review air barrier requirements including surface penetration, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Material to be used shall be delivered in original unopened packages bearing the name of the manufacturer and the brand, expiration date, and direction for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by system manufacturer. Stock of material is to be rotated and used before its expiration date.
- C. Waste Management and Disposal: Refer to Section 01524 – Construction Waste Management and Disposal and as follows: Avoid spillage. Immediately notify Owner or Owner's agent if spillage occurs and start cleanup procedures. Clean spills and leave area as it was prior to spill.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Apply insulation and 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's specifically permits that for the products.
 - 1. Do not apply air barrier in snow, rain, fog, or mist.
 - 2. Do not apply air barrier when the temperature of substrate surfaces and surrounding air temperatures are below or above those recommended by the manufacturer.
 - 3. The product shall not be installed after the expiry date printed on the label of each container.
- B. Substrate: Proceed with spray polyurethane foam application only after substrate construction, penetration work, and relating welding and other hot work has been completed. Verify that mortar has cured sufficiently and masonry substrate is dry to manufacturer's requirements.

1.8 SEQUENCING

- A. Sequence and coordinate application of system with other related work specified in other Sections to comply with the following requirements
 - 1. Ensure that insulating material is installed prior to installation of enclosing or concealing work, with sufficient time allowed for observation, testing, and correction of defective insulation work.
- B. Coordinate installation of system with other work in order to minimize the need for other trades to cut or remove insulation. As other trades successively complete installation of their work, maintain integrity of insulation coating by patching areas that have been removed or damaged prior to concealment by other work.
- C. Ducts, piping, conduit, or other suspended equipment that interfere with the uniform application of the insulation material shall be positioned after the application of sprayed insulation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. BASF Walltile, Wyandotte, Michigan
 - 2. Demilec, Grand Prairie, Texas
 - 3. North Carolina Foam Industries, Mount Airy, North Carolina
 - 4. Foam Enterprises, Inc., Minneapolis, Minnesota
 - 5. Incylthane 2000; PolyMaster, Inc. Knoxville, Tennessee
- B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. The "Substitution Request Form" and complete technical data for evaluation must accompany requests for Architect/Engineer's approval. All materials for evaluation must be received by the Project Manager and Specification Department at least 10 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.

2.2 MATERIALS

- A. Spray Polyurethane Foam: Sprayed-in-place two-component closed –cell polyurethane made by combining an isocyanate (A) component with a polyol (B) component, with the following physical characteristics:

Property	Value	Units	Test Method
Core Density	1.9-2.2	lb/ft ³	ASTM D-1622
Water Vapor	< <u>1.0@2"</u> thick	perms	ASTM E-96

Transmission			
R-Value	7.0(min) @1" thick	hr/ft²F/Btu	ASTM C-518
Compression Strength	25 (min)	psi	ASTM D-1621
Flame Spread	≤25		ASTM E-84
Smoke Developed	≤450		ASTM E-84
Air Leakage	0 @ 6.24 psf	Cfm/ft²	ASTM E-285
Tensile Bond Resistance	>45 for masonry >15 for gypsum sheathing	psi	ASTM C-297
Hydrostatic Pressure Resistance	No failure @ 184.9 cm head pressure		ASTM C-127

1. Corrosion Resistance: Material shall not promote corrosion of bare steel; shop coated steel, or galvanized steel per ASTM E937.
 - a. Corrosion (Electrical Components): Material shall not promote corrosion of copper, steel, or aluminum per ASTM C739.

2.3 AUXILIARY MATERIALS

- A. Primer: Water Based liquid primer for concrete, masonry, gypsum sheathing, wood, metal, and painted substrates.
- B. Sheet Membrane Air Barrier Perimeter Seal to Windows, Doors, Curtainwall, and Storefront Systems: Non-reinforced , cured chloroprene polymer sheet (neoprene) complying with ASTM D-2000 Designation 2BC415 to 3BC620, 50 to 65 mils thick.
 1. Adhesive: Typical contact-type adhesive used for fully-adhered membranes.
 2. Lap Sealant: Typical urethane or silicone lap and termination sealant used for membrane edges recommended by manufacturer
 3. Termination Bars and Fasteners: Stainless steel, aluminum bars and stainless steel fasteners, or galvanized steel.
- C. Sheet Membrane Air Barrier Perimeter Seal to Windows, Doors, Curtainwall, and Storefront Systems: Low modulus silicone sheet; provide manufacturer's standard system consisting of procured low-modulus silicone extrusion, in sizes to fit widths indicated, combined with a neutral-curing low modulus silicone sealant for bonding extrusions to substrates.
- D. Provide sealants in accordance with 07920 – Joint Sealants. Comply with ASTM C920 and ASTM C920 classifications for type, grade, class and uses.
- E. Mineral Wool: 4 lb/cu/ft/ density.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. 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.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for preparing substrates indicated to receive insulation.
 - 1. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air/vapor barrier application.
- B. Prime masonry, concrete substrates with conditioning primer when installing modified asphalt membrane transition membranes.
- C. Cover other Work that might be damaged by fall out or overspray of insulation materials during application.
 - 1. Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
 - 2. Fill voids between masonry and structural steel with mineral wool.
- D. Remove foreign materials, dirt, grease, oil, paint, laitance, efflorescence, and other substances that will affect application.
- E. Ensure that all work by other trades that may penetrate through the air barrier system is in place and complete.

- F. 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.
- G. Install Counter-Flashing
 - 1. Metal: Mechanically fasten metal counter-flashings with screws at 8 inches o.c.
 - 2. Membrane: Cut into and uncover only 3 inches of siliconized release paper along one edge of the counter-flashing membrane. Adhere membrane flashing to the pre-primed substrate a minimum of 3 inches and roll firmly in place.
- H. Ensure veneer anchors are in place.

3.3 APPLICATION

- A. Application of sprayed insulation shall be in accordance with the printed instructions of the material manufacturer and shall be installed in skilled craftsmen. Apply insulation to a reasonably uniform monolithic density without voids.
 - 1. Tolerances: Maximum variation from indicated thickness: Minus (-) 1/4 inch; plus (+) 1/2 inch.
 - 2. Apply in consecutive passes as recommended by manufacturer to thickness as indicated on Drawings. Passes shall be not less than 1/2 inch and not greater than 2 inches.
 - 3. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.
 - 4. Finished surface of foam insulation to be free of voids and embedded foreign objects.
 - 5. 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.
 - 6. Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.
 - 7. 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.
 - 8. 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.
- B. Substrate surface shall be covered with insulation to a minimum thickness of 3 inches.
- C. Provisions shall be made for ventilation to properly dry the insulation after application. In enclosed areas lacking natural ventilation, air circulation and ventilation is to be provided.
- D. Patching and repairing of sprayed insulation damaged by other trades shall be performed under this Section and paid for by the trade(s) causing the damage
 - 1. Complete connections to other components or repair any gaps, holes or other damage using material.

- E. Repair or replace work that has not been successfully protected.
- F. Shield the spray polyurethane foam from interior exposure with an approved thermal barrier.

3.4 FIELD QUALITY CONTROL

- A. Special 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 strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 - 8. Termination mastic has been applied on cut edges.
 - 9. Strips and transition strips 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.
- B. 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 one of the following methods:
 - a. ASTM E 1186, smoke pencil with pressurization or depressurization.
 - b. ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
 - c. ASTM E 1186, chamber depressurization using detection liquids.
 - 2. Quantitative Air Leakage Testing: Testing not to exceed the test pressure differential, positive and negative, indicated in "Performance Requirements" Article for air barrier assembly air leakage according to one of the following methods:
 - a. ASTM E 283
 - b. ASTM E 783
 - c. ASTM E 1677

C. Remove and replace deficient air barrier components and retest as specified above.

3.5 CLEANING

A. After completion of the insulation work, equipment shall be removed and exposed wall and floor areas shall be left in a broom-clean condition.

END OF SECTION