

SECTION 07 27 13.16

THERMOFUSED MEMBRANE AIR BARRIER

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| *Specifier Note: This guide specification is written according to the Construction Specifications Canada (CSC) Format. The section must be carefully reviewed and edited by the Architect or Engineer to meet the requirements of the project. Coordinate this section with other specification sections and the drawings.* |

1. **GENERAL**
   1. SECTION INCLUDES

Thermofused Membrane Air Barrier located in the non-accessible part of the wall.

Materials to bridge and seal the following air leakage pathways and gaps:

Connections of the walls to the roof air barrier.

Connections of the walls to the foundation air barrier.

Seismic and expansion joints.

Openings and penetrations of window frames, storefront, curtain wall.

Barrier precast concrete and other envelope systems.

Door frames.

Piping, conduit, duct and similar penetrations.

Masonry ties, screws, bolts and similar penetrations.

All other air leakage pathways in the building envelope.

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| *Specifier Note: Coordinate related work requirements with contents of referenced specification sections.* |

Section [014000] [Quality Requirements; coordination with Owner’s independent testing and inspection agency.]

Section [014339] [Mock-Ups; exterior wall mock-ups.]

Section [015000] [Temporary Facilities and Controls; requirement to schedule work to prevent sunlight and weather exposure of materials beyond limits established by manufacturer; requirement to protect materials from damage after installation and prior to installation of enclosing work.]

Section [033000] [Cast-In-Place Concrete; requirement that backup concrete be smooth without protrusions.]

Section [042000] [Unit Masonry; requirement that backup masonry joints are flush and completely filled with mortar, and that excess mortar on brick ties will be removed; requirement for gap at deflection joints and fillers; coordination with sequencing of through-wall flashing.]

Section [061600] [Sheathing; requirement that backup gypsum sheathing has been installed.]

Section [075000] [Membrane Roofing; requirement for coordination with sequencing of membrane roofing; requirement to seal roof membrane to wall air barrier.]

Others: [\_\_\_\_\_\_]

* 1. PERFORMANCE REQUIREMENTS

Material Performance: Provide air barrier materials which have an air permeance not to exceed 0.02 litres per square metre per second under a pressure differential of 75 Pa (0.02 L/(s·m2) @ 75 Pa) [0.004 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.004 cfm/ft2 @ 1.57 psf)], when tested in accordance with ASTM E2178 (unmodified).

The water vapor permeance [Procedure A (Desiccant method) and Procedure B (Water method)] shall be determined in accordance with ASTM E96 and shall be declared by the material manufacturer.

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| *Specifier Note: The water vapour permeance is declared by the manufacturer and included in this document so that the design professional has this information readily available.* |

Assembly Performance: Provide a continuous air barrier in the form of an assembly that has an air leakage not to exceed 0.2 litres per square metre per second under a pressure differential of 75 Pa (0.2 L/(s·m2) @ 75 Pa) [0.04 cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot (0.04 cfm/ft2 @ 1.57 psf)] when tested in accordance with ASTM E2357. The assembly shall accommodate movements of building materials by providing expansion and control joints as required. Expansion / control joints, changes in substrate and perimeter conditions shall have appropriate accessory materials at such locations.

The air barrier assembly shall be capable of withstanding combined design wind, fan and stack pressures, both positive and negative on the envelope without damage or displacement, and shall transfer the load to the structure.

Materials of the air barrier assembly shall not displace adjacent materials in the assembly under full load.

The air barrier assembly shall be joined in an airtight and flexible manner to the air barrier materials of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations, creep, and anticipated seismic movement.

Connections to Adjacent Materials: Provide air barrier accessory materials to prevent air leakage at the following locations:

Foundation and walls, including penetrations, ties and anchors.

Walls, windows, curtain walls, storefronts, louvers and doors.

Different assemblies and fixed openings within those assemblies.

Wall and roof connections.

Floors over unconditioned space.

Walls, floor and roof across construction, control and expansion joints.

Walls, floors and roof to utility, pipe and duct penetrations.

Seismic and expansion joints.

All other potential air leakage pathways in the building envelope.

* 1. SUBMITTALS

Submittals: Submit in accordance with Division 1 requirements.

Quality Assurance Program: Submit evidence of current Contractor accreditation and Installer certification under the National Air Barrier Association’s (NABA) Quality Assurance Program (QAP). Submit accreditation number of the Contractor and certification number(s) of the NABA Certified Installer(s).

Product Data: Submit material manufacturer’s Product Data, instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.

Samples: Submit clearly labeled samples, 75 mm by 100 mm [3 inches by 4 inches] minimum size of each material specified.

Shop Drawings of Mock-Up: Submit Shop Drawings of proposed mock-ups showing plans, elevations, large-scale details, and connections to the test apparatus.

Field Test Results of Mock-Up: Submit test results of air leakage test and water leakage test of mock-up in accordance with specified standards (see Section 1.3, .16), including retesting if initial results are not satisfactory.

Shop Drawings: Submit Shop Drawings showing locations and extent of air barrier assemblies and details of all typical conditions, intersections with other envelope assemblies and materials, transition membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated, how materials that cover the materials are secured with air tight condition maintained, and how miscellaneous penetrations such as conduits, pipes, electric boxes and similar items are sealed.

Include VOC content of each material, and applicable legal limit in the jurisdiction of the project.

Include required values for field adhesion test on each substrate.

Air Barrier Subcontractor Qualifications: Air barrier Subcontractor(s) shall be accredited at the time of bidding and during the complete installation, period by the National Air Barrier Association (NABA) whose Installer(s) are certified in accordance with the site Quality Assurance Program used by NABA.

Thermofused membrane air barrier Installer(s) shall be certified by BPQI (Building Performance Quality Institute) for the NABA Quality Assurance Program in accordance with the requirements outlined in the QAP program used by NABA. Installers shall have their photo-identification air barrier certification cards in their possession and available on the project site, for inspection upon request.

Manufacturer: Obtain primary NABA Evaluated Materials from a single NABA Listed Manufacturer regularly engaged in manufacturing specified thermofused membrane air barriers. Obtain secondary materials from a source acceptable to the primary material manufacturer.

Accredited Laboratory Testing for Materials: Laboratory accredited by International Accreditation Service Inc. (IAS), American Association for Laboratory Accreditation (A2LA), or the Standards Council of Canada (SCC).

VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds.

Field Quality Assurance: Implement the site Quality Assurance Program requirements used by NABA. Cooperate with NABA Auditors and any independent testing and inspection agencies engaged by the Owner. Do not cover the air barrier assembly until it has been inspected, tested and accepted.

Air Barrier Assembly Testing: Verify air barrier assembly testing by the material manufacturer by visiting the NABA website to ensure a ASTM E2357 test has been completed and to obtain results. Visit the NABA website for the reported air barrier assembly leakage rate and illustrations or CAD details which includes the methods in which the assembly test mock-ups shall be assembled.

* 1. DELIVERY, STORAGE, AND HANDLING

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

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

Handle materials in accordance with material manufacturer’s requirements.

* 1. PROJECT CONDITIONS

Temperature: Install thermofused membrane within range of ambient and substrate temperatures and material moisture content recommended by material manufacturer.

Field Conditions: Do not install air barrier materials in snow, rain, fog, or mist.

Sequencing. Do not install air barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.

Compatibility. Do not allow air barrier materials to come in contact with chemically incompatible materials.

Ultra-Violet Exposure. Do not expose air barrier materials to sunlight longer than as recommended by the material manufacturer (if applicable).

* 1. WARRANTY

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| *Specifier Note: Verify warranty length with manufacturers specified.* |

Material Warranty: Provide material manufacturer’s standard product warranty, for a minimum three (3) years from date of Substantial Completion.

Subcontractor (approved by NABA and Manufacturer) Installation Warranty: Provide a two (2) year installation warranty from date of Substantial Completion, including all materials of the air barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of attachment, loss of cohesion/adhesion and failure to cure properly.

* 1. PRE-CONSTRUCTION MEETING

Preconstruction Meeting: Convene a minimum of two weeks prior to commencing work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of construction, coordination with substrate preparation, air barrier materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction and chemical/fire safety plans. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

* 1. MOCKUPS

Mock-Ups: Build mock-up representative of primary air barrier assemblies and glazing assemblies including backup wall and typical penetrations as acceptable to the Architect. Mock-up shall be dimensions no less than 2.50 metres long by 2.50 metres high [eight (8) feet long by eight (8) feet high] and include the materials and accessories proposed for use in the exterior wall assembly. Mock-ups shall be suitable for testing as specified in the following paragraph.

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| *Specifier Note: Coordinate testing with project requirements. Delete paragraph below if not required or if Owner’s independent testing agent will perform testing.* |

Mock-Up Tests for Air and Water Infiltration: The third party testing agency shall test the mock-up for air and water infiltration in accordance with ASTM E1186 (air leakage location), ASTM E783 (air leakage quantification) at a pressure difference of 1.57 lb/ft2 (75 Pa), and ASTM E1105 (water penetration). Use smoke tracer to locate sources of air leakage. If deficiencies are found, the air barrier Contractor shall reconstruct mock-up for retesting until satisfactory results are obtained. Deficiencies include air leakage beyond values specified, uncontrolled water leakage, unsatisfactory workmanship.

Perform the air leakage test and water penetration test of mock-up prior to installation of cladding and trim but after installation of all fasteners for cladding and trim and after installation of other penetrating elements.

Mock-Up Tests for Thermofused Membrane Air Barrier Adhesion: Test mock-up for thermofused membrane adhesion in accordance with ASTM D4541 (modified), using a type II pull tester except that the membrane shall be cut through to separate the material attached to the disc from the surrounding material. Perform test after curing period recommended by the material manufacturer. Record mode of failure and area where the material failed in accordance with ASTM D4541. When the material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report shall indicate whether this requirement has been met. Where the material manufacturer has not declared a minimum adhesion value for their product/substrate combination, the value shall simply be recorded.

1. **MATERIALS**

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| *Specifier Note: Retain manufacturers listed below. Note that both water-based and solvent based primers are typically used on a single project based on the substrate and weather conditions.* |

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| *Specifier Note: Use regular, high temperature or low temperature formulation depending on site conditions, within temperature ranges specified by material Manufacturer.* |

* 1. Material: [trade name] by [company name] at [material thickness] mils thick): [[company website hyperlink](http://www.airbarrier.org)]

Air Barrier Material Properties:

Air permeance for this material has been tested and reported as being 0.0002 litres per square metre per second under a pressure differential of 75 Pa [X.XXX] L/(s·m2) @ 75 Pa), [[X.XXX] cubic feet per minute per square foot under a pressure differential of 1.57 pounds per square foot ([X.XXX] cfm/ft2 @ 1.57 psf)], when tested in accordance with ASTM E2178 (unmodified).

Water vapour permeance for this material has been tested and reported as being [XX.X] nanograms of water vapour passing through each square metre of area per second for each Pascal of vapour pressure differential (XX ng/(Pa·s·m2)  [[XX.X] US perms] when tested in accordance with ASTM E96 [Procedure A (Desiccant method) – unmodified].

Water vapour permeance for this material has been tested and reported as being [XX.X] nanograms of water vapour passing through each square metre of area per second for each Pascal of vapour pressure differential ([XX.X] ng/(Pa·s·m2)  [[XX.X] US perms] when tested in accordance with ASTM E96 [Procedure B (Water method)- unmodified].

Air Barrier Accessory Materials:

Water-Based Primer:

Solvent-Based Primer:

Solvent-Based Aerosol Primer:

Adhesive:

Mastic:

Sealants:

Transition Membrane for details and terminations:

Reinforcing/Joint Tape:

Flashing at Transition Membrane:

Counter-flashing for Masonry Through-Wall Flashings:

Through-Wall Flashings or Shelf Angle Flashings:

Solvent-Based Primer for Flashing, Transition Strip and Detail Membrane:

Water-Based Primer for Flashing, Transition Strip and Detail Membrane:

Substrate Joint Treatment:

**[OR]**

* 1. [Specifier to add other materials]

1. **EXECUTION**
   1. FIRE PROTECTION

Prior to the start of work, conduct a site inspection to establish safe working practices and make sure that all procedures and proposed changes are approved to minimize the risk of fires.

Respect safety measures described in documentation from manufacturer as well as [local association] recommendations.

At the end of each work day, use a heat detector gun to spot any smoldering or concealed fire. Job planning must be organized to ensure workers are still on location at least one hour after torch application.

Never apply the torch directly to old, wood, or other combustible substrates.

Throughout membrane installation, maintain a clean site and have one approved ABC fire extinguisher within 6 meters of each propane torch. Respect all safety measures described in technical data sheets. Torches must never be placed near combustible or flammable products. Torches should never be used where the flame is not visible or cannot be easily controlled.

* 1. EXAMINATION

The Air Barrier Contractor shall examine substrates, areas, and conditions under which the Air Barrier Assembly will be installed, with NABA Certified Installer(s) 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.

Ensure that the following conditions are met:

Surfaces are sound, dry, even, and free of excess mortar or other contaminants.

Inspect substrates to be smooth without large voids or sharp protrusions. Inform General Contractor if substrates are not acceptable and need to be repaired by the concrete sub-trade.

Inspect masonry joints to be reasonably flush and completely filled, and ensure all excess mortar sitting on masonry ties has been removed. Inform General Contractor if masonry joints are not acceptable and need to be repaired by the mason sub-trade.

Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263 and take suitable measures until substrate passes moisture test.

Verify sealants are compatible with membrane proposed for use. Perform field peel-adhesion test on materials to which sealants are adhered.

Notify Architect or the owner representative in writing of anticipated problems using thermofused membrane air barrier over substrate prior to proceeding.

Dynamic cracking in substrate, or cracks greater that 3mm in width shall be reported to the owner’s representative prior to the thermofused membrane installation. Static cracking up to 3 mm in width must be covered with a transition membrane strip 150 mm wide, centered on the crack. This strip is to be installed before the installation of the covering thermofused membrane.

The exterior of the building shall be heated and/or hoarded in extreme ambient weather conditions if the thermofused membrane is being installed when the interior of the building is being heated.

* 1. SURFACE PREPARATION

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

Ensure that penetrating work by other trades is in place and complete.

Prepare surfaces by brushing, scrubbing, scraping, grinding or compressed air to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of the thermofused membrane air barrier.

Where there are release agents or other non-compatible coatings, wipe down surfaces to remove these release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the specified material.

Ensure cladding veneer anchors are in place if they are able to be heated.

Prime substrate for installation of transition membrane strips if recommended by material manufacturer and as follows:

Prime masonry, concrete substrates with conditioning primers.

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

Prime metal, and painted substrates with primer.

Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier at protrusions.

* 1. THROUGH-WALL FLASHING MEMBRANE INSTALLATION

Through-wall flashing membrane should be installed where applicable as indicated on drawings and as per manufacturers installation instructions.

* 1. INSTALLATION

Thermofused Membrane Air Barrier: Install thermofused membrane in accordance with manufacturer's recommendations and as follows:

Cut and install thermofused membrane strips in lengths of 2 – 3 meters on walls to ensure the membrane is installed straight.

Where masonry anchors are already in place prior to the thermofused membrane installation, install the membrane in a manner which will facilitate application around brick ties. The installation should being from the bottom and work in an upward direction along the wall surface, using the width recommended by the manufacturer

Install the thermofused membrane segments in a manner which will facilitate application around brick ties around the masonry anchors. Weld the membrane in place using a propane torch. Cut the membrane at each anchor. Fold the membrane onto the wall surface on either side of the anchor while welding it into place.

Apply thermofused membrane complete and continuous to prepared substrates

Position thermofused membrane for alignment and apply heat to underside of the membrane using a propane torch.

Apply sufficient heat to make bitumen tacky and firmly press membrane onto substrate to ensure complete contact and bond for the full extent of the membrane

Apply thermofused membrane sheets in a "shingled" fashion to shed water naturally without interception by a sheet edge, unless that edge is sealed with termination mastic.

Position subsequent sheets of thermofused membrane applied above so that membrane overlaps the membrane sheet below by 50 mm and use a heated trowel to fully seal laps.

Overlap horizontally adjacent pieces 50 mm and use a heated trowel to fully seal laps.

Seal around all penetrations by using a heated trowel to butter compound at the interface

Coordinate the installation of air barrier with roof installer to ensure continuity of membrane with roof air barrier.

Provide mechanically fastened backing material compatible with the membrane to span gaps in substrate plane and to make a smooth transition from one plane to the other. Thermofused membrane must be continuously supported by substrate.

Apply a bead or trowel coat of mastic along cuts, penetrations or other locations required by the manufacturer.

At end of each working day, seal top edge of thermofused membrane to substrate with termination mastic.

Do not expose membrane to sunlight for any period longer than what the manufacturer has recommended prior to enclosure. Obtain manufacturers written approval if membrane is exposed for more than 30 days.

Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of membrane sized to extend 100 mm in all directions from the perimeter of the affected area. Do not cover membrane until it is inspected [and tested].

Connect thermofused membrane in exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, floor-to floor, window system, glazed curtain wall system, storefront system, exterior doors and all other system intersection conditions and perform sealing of all penetrations, using accessory materials.

Mechanically fasten thermofused membrane through securement bars to all windows, door, louvers and curtain wall sections as recommended by membrane manufacturer where proper adhesion and bonding cannot be maintained.

Connect thermofused membrane over concrete foundations and as otherwise indicated.

Where installation cannot be carried out with a sheet applied thermofused membrane, use a self-adhered sheet rubberized asphalt membrane, using a primer, as recommended by the membrane manufacturer. Apply firm pressure on the self-adhered sheet rubberized asphalt membrane surface in order to ensure proper adhesion. Where the self-adhered sheet rubberized asphalt membrane is jointed to a sheet applied thermofused membrane, the self-adhered sheet rubberized asphalt membrane should always overlap on top of the other, and the joint be sealed with mastic or a modified bitumen self-adhered sheet designed to receive torch application.

* 1. FIELD QUALITY CONTROL

Owner’s Inspection and Testing: Cooperate with Owner’s testing agency. Allow access to work areas and staging. Notify Owner’s testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted.

National Air Barrier Association Installer Audits: Cooperate with NABA’s testing agency. Allow access to work areas and staging. Notify NABA in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted. Arrange and pay for site audits by NABA to verify conformance with the material Manufacturer’s instructions, the site Quality Assurance Program used by NABA, and this section of the project specification.

Audits and subsequent testing shall be carried out at the following rate:

$1 - 50,000 Air Barrier Contract Value - 1 audit required

$50,001 - 150,000 Air Barrier Contract Value - 2 audits required

Over $150,000 Air Barrier Contract Value – 1 audit required for every $100,000 in Air Barrier Contract Value.

Additional field audits may be required on a specific project as required by NABA QAP Administrator.

Forward written inspection reports to the Architect within 10 working days of the inspection and test being performed.

If the inspections reveal any defects, promptly remove and replace defective work at no additional cost to the Owner.

* 1. PROTECTING AND CLEANING

Protect air barrier materials from damage during installation and the remainder of the construction period, according to material manufacturer's written instructions.

Coordinate with installation of materials which cover the air barrier assemblies, to ensure exposure period does not exceed that recommended by the material manufacturer.

Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION