



Evaluation Report CCMC 13659-R WALLTITE® v.3 - Air Barrier System

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “WALLTITE® v.3 - Air Barrier System,” when used as an air barrier system for exterior walls of buildings in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code (NBC) of Canada 2015:

- Clause 1.2.1.1(1)(a) of Division A, as an acceptable solution from Division B:
 - Article 5.1.4.1., Structural and Environmental Loads
 - Article 5.1.4.2., Resistance to Deterioration
 - Subsection 5.2.2., Structural Loads and Design Procedures
 - Subsection 5.4.1., Air Barrier Systems
 - Article 9.25.3.1., Required Barrier to Air Leakage (exterior walls only)
 - Sentence 9.25.3.2.(1), Air Barrier System Properties (effective barrier to air infiltration and exfiltration)
 - Article 9.25.3.3., Continuity of the Air Barrier System (exterior walls only)
 - Clause 9.27.4.2.(2)(b), Materials (ASTM C 920-14, “Elastomeric Joint Sealants”)
- Clause 1.2.1.1(1)(b) of Division A, as an alternative solution that achieves at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the following applicable acceptable solutions:
 - Sentence 9.25.3.2.(2), Air Barrier System Properties (alternative to 6 mil polyethylene air barrier)
 - Clause 9.27.4.2.(2)(b), Materials (ASTM C 920-14, “Elastomeric Joint Sealants”)

This opinion is based on CCMC’s evaluation of the technical evidence in Section 4 provided by the Report Holder.

Ruling No. 14-14-310 (13659-R) authorizing the use of this product in Ontario, subject to the terms and conditions contained in the Ruling, was made by the Minister of Municipal Affairs and Housing on 2014-10-27 pursuant to s.29 of the *Building Code Act*, 1992 (see Ruling for terms and conditions). This Ruling is subject to periodic revisions and updates.

2. Description

This report addresses the performance of the product as an air barrier system as specified by BASF Canada. The “WALLTITE® v.3 - Air Barrier System” consists of the following components and accessories:

- principal material in the plane of airtightness: “WALLTITE® v.3” spray polyurethane foam;
- accessories for continuity:
 - Blue Skin®, a modified bituminous membrane (i.e., peel-and-stick or thermally fused) manufactured by Henry® Company for use as a transition membrane⁽¹⁾ over construction, control and expansion joints, at junctions between different assemblies and at penetrations; and
 - MasterSeal® NPI™ by BASF Canada and Polybitume 570-05 by Henry® Company sealants, for use at membrane-to-foundation junctions and for use on the interior side around window and door openings; and
- component for wind load resistance: structural substrate, such as concrete block or exterior gypsum sheathing within a wall designed to withstand the anticipated loads.

If installed as part of the designated air barrier system, “WALLTITE® v.3” spray urethane foam serves a dual function in the wall assembly: as the principal plane of airtightness of the designated air barrier system and as exterior insulation. The use of the product as insulation is covered under CCMC 13588-L.

The foam insulation consists of two components: “Elastospray® 8000A” isocyanate and a polyurethane resin identified as “WALLTITE® v.3.” The two components are mixed on-site by an installer approved by BASF Canada to install the product. The resulting product is a Type 2 spray urethane with an assigned long-term thermal resistance value of 2.14 m²·°C/W per 50 mm. If the foam insulation serves as the principal component in the BASF Canada proprietary air barrier system, it must be installed at a minimum thickness and density, which are specified in Section 3 of this Report. As per CCMC 13588-L, the finished product is purple.

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- (1) The original full-scale testing was carried out with one proprietary transition membrane. Other proprietary membranes are qualified for use by BASF Canada through a small-scale tension test (i.e. “WALLTITE® v.3” sprayed specimens over various substrates) to ensure the equivalent adhesion is maintained.
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3. Conditions and Limitations

CCMC’s compliance opinion in Section 1 is bound by the “WALLTITE® v.3 - Air Barrier System” being used in accordance with the conditions and limitations set out below.

- The product, with a minimum thickness of 25.4 mm (1.0 in) of “WALLTITE® v.3” spray urethane at a 39.1 kg/m³ density, has demonstrated sufficiently low air permeance with an air leakage rating of A1 (less than 0.05 L/s·m²·Pa at 75 Pa reference ΔP) when tested in accordance with CAN/ULC-S742-11, “Air Barrier Assemblies - Specification.” This air leakage conforms to the permissible air leakage rate in Table 4.1.1 of this Report for as the outermost layer of the exterior wall assembly. The WVP of this product at a 25.4 mm thickness is approximately 51 ng/(Pa·s·m²).
- In the above-mentioned specified steel stud construction, the product has demonstrated sufficient strength to resist wind loads so it can be used in the following height of buildings in geographical locations where:
 - the wind pressure $Q_{50} \leq 450$ Pa (1-in-50-year wind pressure return period found in Appendix C of the NBC 2015), for maximum building height of 60 m;
 - the wind pressure $Q_{50} \leq 850$ Pa, for maximum building height of 20 m;
 - the wind pressure $Q_{50} \leq 1000$ Pa, for maximum building height of 12 m;
 - the maximum deflection recorded for the steel stud assembly was 5.33 mm for a gust wind load of $\pm 1\ 630$ Pa.
- In the above-mentioned specified concrete block construction, the product has demonstrated sufficient strength to resist wind loads so it can be used in the following height of buildings in geographical locations where:
 - the wind pressure $Q_{50} \leq 650$ Pa (1-in-50-year wind pressure return period found in Appendix C of the NBC 2015), for maximum building height of 120 m;
 - the wind pressure $Q_{50} \leq 750$ Pa, for maximum building height of 80 m;
 - the wind pressure $Q_{50} \leq 850$ Pa, for maximum building height of 40 m;
 - the wind pressure $Q_{50} \leq 1000$ Pa, for maximum building height of 20 m;
 - the maximum deflection recorded for the steel stud assembly was – 1.83 mm for a gust wind load of $\pm 2\ 560$ Pa.
- To provide the air leakage control and strength in the field, the product must be installed conforming to the limits above and installed in the field by Caliber-certified installers/contractors according to the “WALLTITE® v.3 - Air Barrier System Insulation Specification” dated June 1, 2015, which contains detailed construction drawings that must be followed. Caliber must conduct the necessary follow-up inspections to ensure that Caliber-certified contractors are performing the necessary field quality control (for example, transition membrane application, membrane adhesion/pull testing before spraying, sealant application before spraying, spray foam as per CAN/ULC S705.2-05, “Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application”). All results must be recorded on the Caliber daily worksheet for the “WALLTITE® v.3 - Air Barrier System.”
- A copy of the installation instructions must be available on the job site at all times during the installation for review by building officials. All installers must present their Caliber identification card upon request by the building official.
- The product must be identified with the manufacturer’s name or logo and the phrase “CCMC 13659-R.”

The product must be installed on-site by BASF Canada-trained installers following the BASF Canada specified product installation manual entitled “WALLTITE® v.3 Application Guidelines,” and dated March 23 2015, which contains detailed construction drawings which must be followed (see Appendix A of this Report for examples). In addition, Caliber carries out follow-up inspections of the installations on a periodic basis.

Air Barrier System - Field Quality Assurance

When the “WALLTITE® v.3” spray urethane is applied as the designated air barrier system, BASF Canada requires that the installer be BASF Canada-trained and that Caliber conduct audits to ensure:

1. the approved accessories are being used;
2. proper installation of the transition membrane by conducting periodic tension testing as part of the BASF Canada-specified quality control;
3. proper continuity details and substrate conformance as part of the quality control procedure for the product;
4. proper application of the “WALLTITE® v.3” spray foam; and
5. daily work records are maintained for the air barrier system installation.

Insulation - Field Quality Assurance

When the proposed spray polyurethane is applied as spray-foam insulation, the material must be manufactured on-site by qualified installers licensed by BASF Canada with field inspections carried out by Caliber. Caliber certifies BASF Canada’s training program and provides follow-up inspections to ensure installations are in accordance with CAN/ULC-S705.2-05, “Standard for Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density, Installer’s Responsibilities – Specification.”

The product must be installed in accordance with the manufacturer’s installation manual. A copy of this manual must be available on the job site at all times during the installation. All installers must present their BASF Canada licensing card and specific site worksheet upon request by the building official.

Note: The BASF Canada field quality assurance program calls for periodic audits of the installers, usually random inspections with some mandatory inspections of larger projects. Building officials may contact BASF Canada (866-474-3538) and request an inspection for a specific job site if they deem it necessary. In cases where the installation is deemed non-conforming by Caliber/BASF Canada and is not remedied by the installer, Caliber/BASF Canada will inform the owner/architect/building official of the non-conforming installation.

See CCMC 13588-L for additional limitations on the installation of the “WALLTITE® v.3” spray-foam product.

“Elastospray® 8000A” isocyanate and the polyurethane resin “WALLTITE® v.3” must have their containers (i.e., drums) identified by the phrase “CCMC 13659-R” and “CCMC 13588-L,” respectively.

4. Technical Evidence

The Report Holder has submitted technical documentation for CCMC’s evaluation. Testing was conducted at laboratories recognized by CCMC. The corresponding technical evidence for this product is summarized below.

4.1 Performance Requirements

The results of testing the product, conducted on four representative specimens⁽³⁾, are summarized in Tables 4.1.1 and 4.1.2. The performance resulting from these tests has been deemed applicable to “WALLTITE® v.3 - Air Barrier System” based on equivalency testing.

The performance of the product has been tested in accordance with the CCMC Technical Guide for qualification for use as an air barrier system.

To qualify, a conforming air barrier system must:

- i. have an acceptable low air leakage rate;
- ii. be continuous;
- iii. be durable;
- iv. have sufficient strength to resist the anticipated air pressure load; and
- v. be buildable in the field.

Table 4.1.1 Results of Testing the Air Leakage Rate of the Product

Type of Wall Tested	Requirement ⁽³⁾ (S742 Classification)	Air Leakage Rate After Wind Loading ⁽¹⁾ at 75 Pa ΔP	Air Leakage Rate After Wind Loading at –20°C and at 75 Pa ΔP ²
Exterior gypsum/metal stud walls	A1 (≤ 0.05 L/s·m ²)	0.030 L/(s·m ²)	0.042 L/(s·m ²) ⁽²⁾
Concrete masonry units		0.041 L/(s·m ²)	0.044 L/(s·m ²) ⁽²⁾

Notes to Table 4.1.1:

- (1) The air leakage rate of the specimens was determined after structural aging of the air barrier system. Aging of the air barrier system was conducted to qualify it for various Q_{50} design structural wind loads. For the stud wall, the air barrier system was subjected to a loading schedule involving one-hour sustained positive and negative pressure set at 1000 Pa, 2 000 cycles of positive and negative pressure set at 1630 Pa, wind gust of positive and negative pressure set at 2440 Pa, and deflection loading at ± 1630 Pa for ten seconds. For the block wall, the air barrier system was subjected to a loading schedule involving one-hour sustained positive and negative pressure set at 1000 Pa, 2 000 cycles of positive and negative pressure set at 2560 Pa, wind gust of positive and negative pressure set at 3820 Pa, and deflection loading at ± 2560 Pa for ten seconds.
- (2) The air leakage rate was determined in accordance with ASTM E 1424, “Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen,” at an air temperature of -20°C to verify any deformation causing leakage at low temperatures.
- (3) The air leakage rate requirement is based on the Table for Rate of Permissible Air Leakage developed by CCMC/NRC with input from an industry consortium. Information in Table 4.1.1 is deemed to meet the intent of the NBC 2015 with regard to air barrier system performance.

Permissible Air Leakage Rate

Water Vapour Permeance of Outermost Layer of Wall Assembly (ng/(Pa·s·m ²))	Maximum Permissible Air Leakage Rate (L/s·m ²) @ 75 Pa ΔP
15 < WVP \leq 60	0.05
60 < WVP \leq 170	0.10
170 < WVP \leq 800	0.15
> 800	0.20

For more information on the CCMC Technical Guide requirements and how they relate to the NBC 2010 requirements, please see the IRC Publication, *Air Barrier Systems for Walls of Low-Rise Buildings: Performance and Assessment*.

4.1.2 Durability of Air Barrier System Components

Table 4.1.2 Results of Durability Testing of Components in the “WALLTITE® v.3 - Air Barrier System”

Component	Requirement	Result
“WALLTITE® v.3” urethane insulation	air permeance before and after aging (ASTM D 726-84): < 10% increase	Passed
	thermal resistance after heat aging and weathering: 90% retention	Passed
Transition membrane: Blue Skin SA by Henry® Company	physical properties before and after aging: 85% retention	Passed
Sealant at membrane/foundation junctions: Polybitume 570-05 by Henry® Company	complies with CAN/CGSB-37.29-M89	Passed
MasterSeal® NP1™ by BASF Canada	complies with ASTM C 920-14	Passed

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APPENDIX A

A-1. Specimens Tested for Qualifying System Details

Figures A-1 to A-4 outline the original full-scale specimens tested with “WALLTITE® v.3” spray-urethane, which represent typical construction details to be reproduced in the field as part of the installation of BASF Canada’s current proprietary “WALLTITE® v.3 - Air Barrier System.” The representative specimens tested also contained defects (e.g., mortar missing, missing primer gap, etc.) to verify the sensitivity of the air barrier system to these possible field defects and allow for tolerances. See the “BASF WALLTITE® Technical Guide” for complete details.

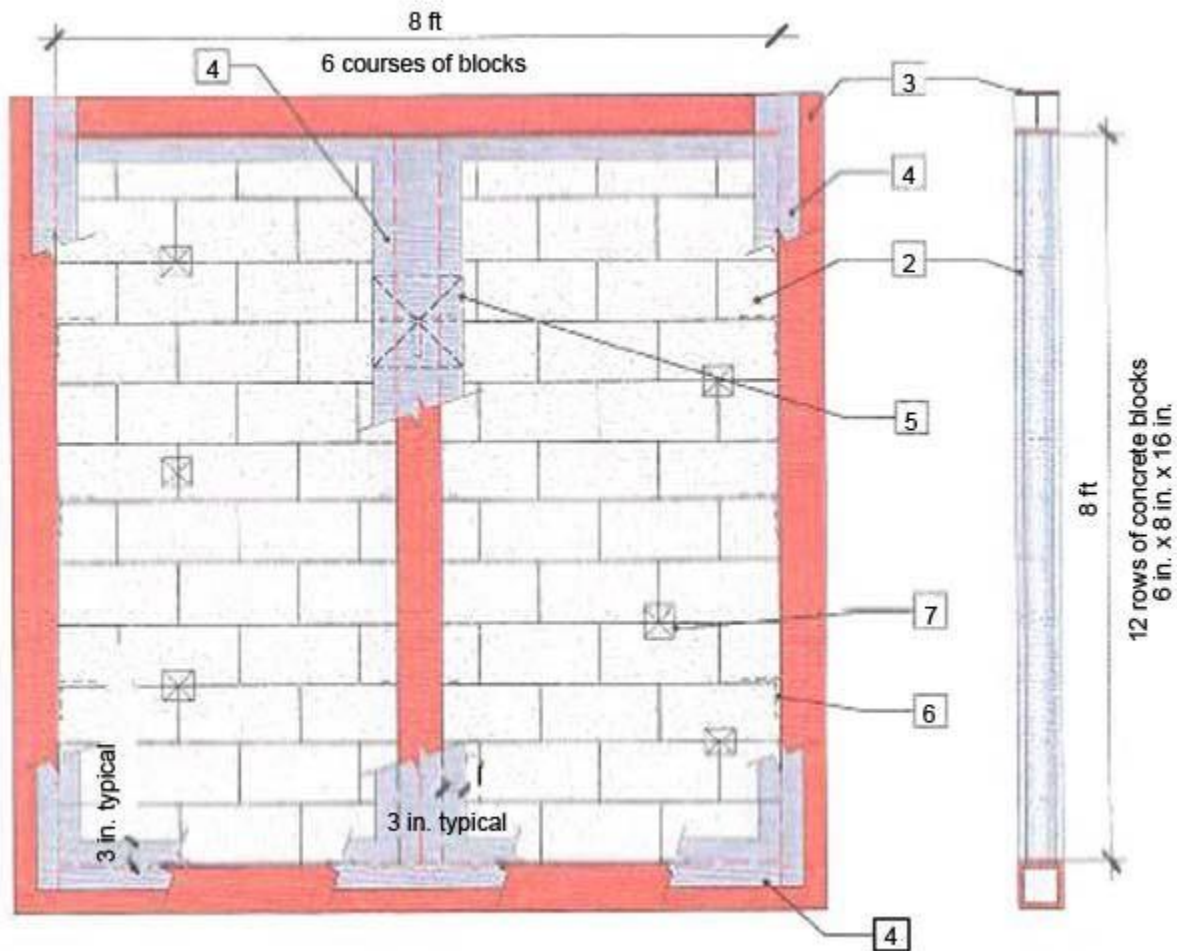


Figure A-1. Specimen No. 1: Example of continuity across joints with transition membrane in masonry block infill wall with a steel frame

1. 25.4-mm-thick “WALLTITE® v.3” spray urethane foam installed over surface of wall (not shown)
2. concrete blocks
3. steel frame
4. peel-and-stick bituminous membrane with primer
5. peel-and-stick bituminous membrane without primer
6. structural tie
7. intentional mortar joint defect for testing

All construction, control or expansion joints in an exterior wall assembly must be bridged by a transition membrane as part of the “WALLTITE® v.3 - Air Barrier System.”

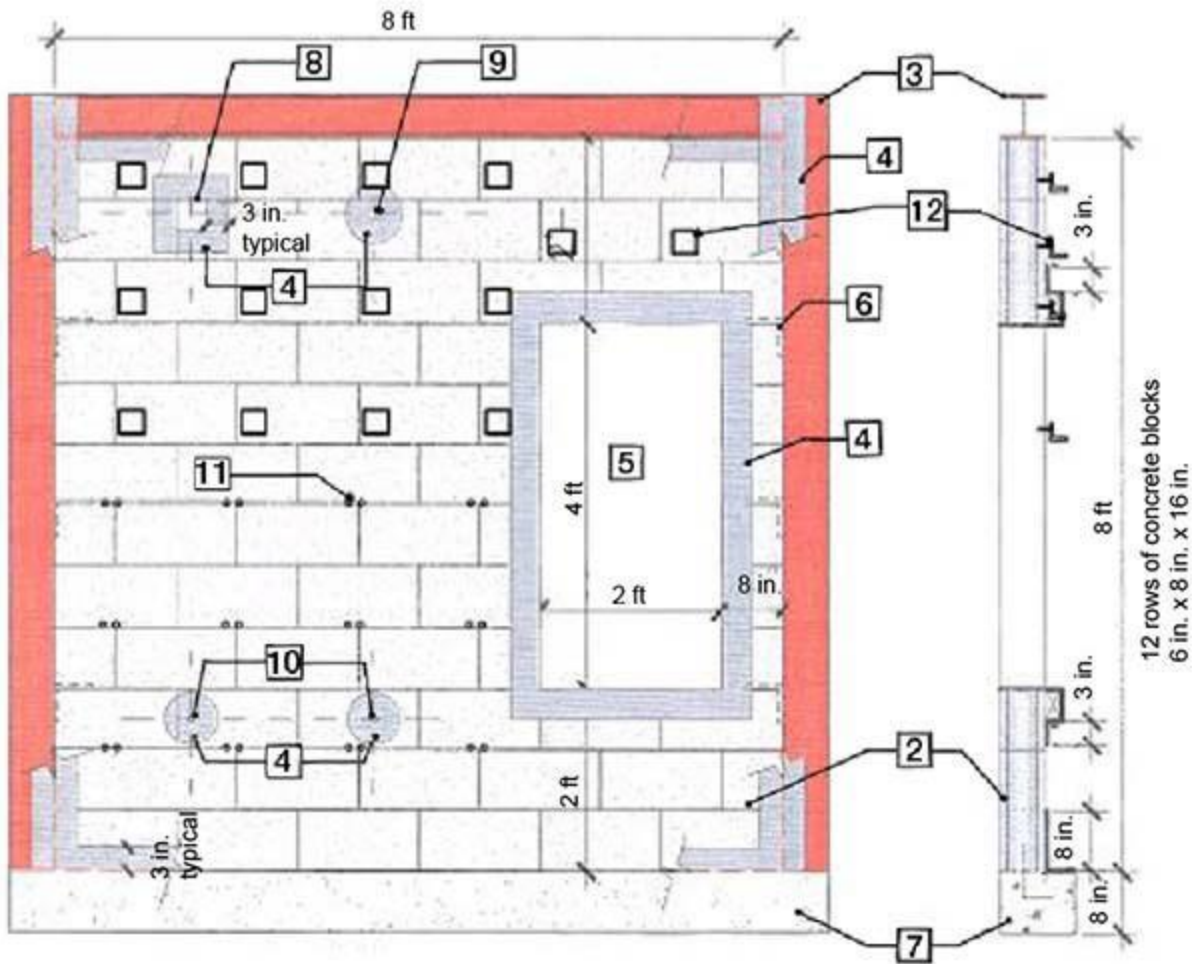


Figure A-2a. Specimen No. 2: Example of continuity across junctions and penetrations in masonry block infill wall with a steel frame and at foundation wall

1. 25.4-mm-thick “WALLTITE® v.3” spray urethane foam installed over surface of wall (not shown)
2. concrete blocks
3. steel frame
4. peel-and-stick bituminous membrane with primer
5. window opening
6. structural tie
7. concrete footing
8. galvanized steel duct
9. steel pipe
10. electrical conduit
11. reinforcing ties
12. brick veneer anchors

Since the foundation wall is designated as part of the air barrier system in this case, a transition membrane with sealant (see cross-section details) must be sealed to the foundation wall to maintain the continuity of the plane of airtightness. In addition, note that mechanical fasteners for brick veneer and penetrations from electrical wiring, pipes or ducts must be sealed through the use of a transition membrane.

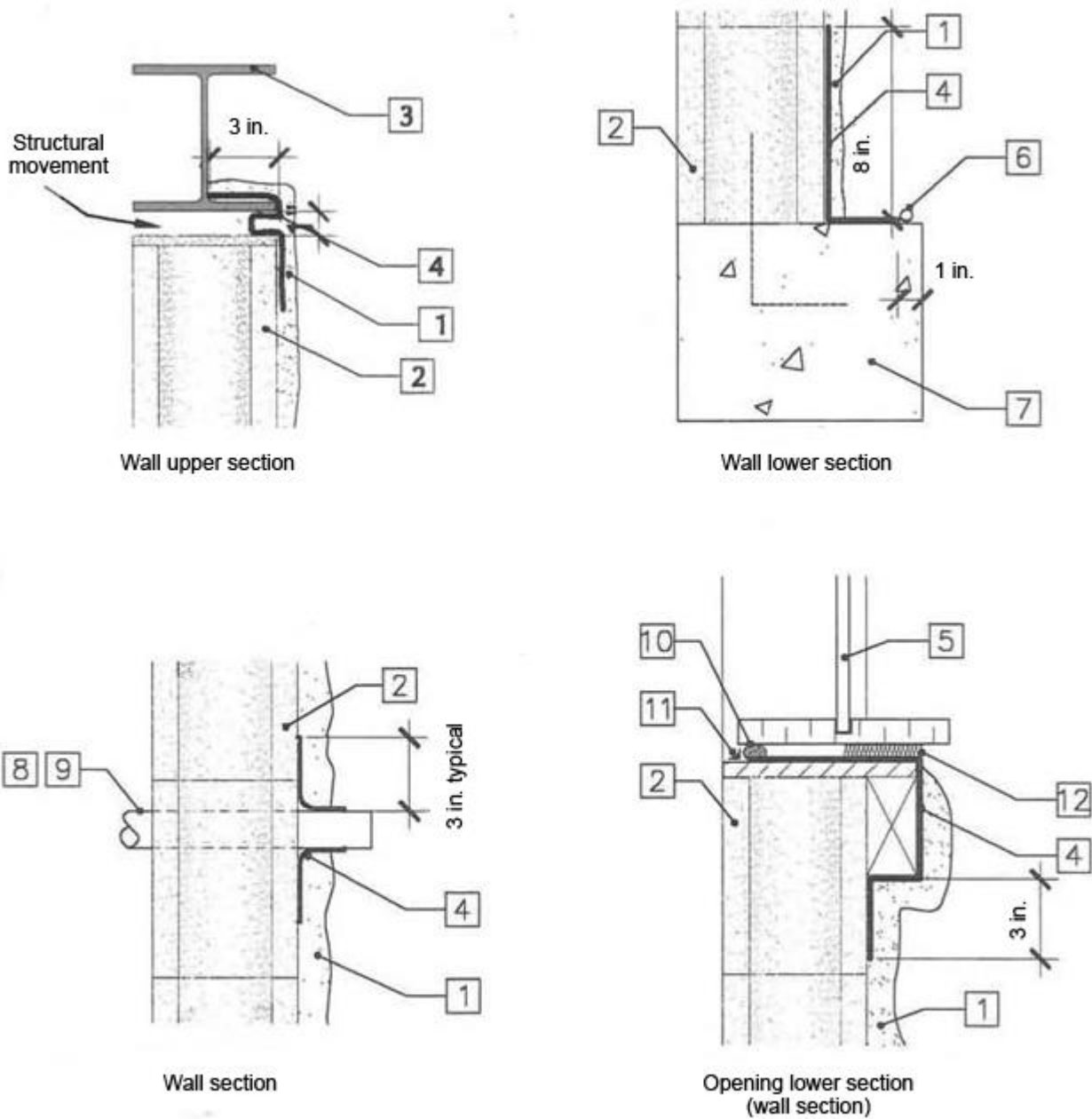


Figure A-2b. Details of transition membrane at joints between masonry wall and steel frame

1. 25.4-mm-thick "WALLTITE® v.3" spray urethane foam installed over surface of wall
2. concrete blocks
3. steel structure
4. self-adhesive membrane section with primer
5. opening
6. polymer base caulking strip
7. 8 in. × 10 in. concrete footing with reinforcement
8. 4 in. × 4 in. galvanized steel duct
9. 1 ½ in. dia. steel pipe
10. foam seal gasket
11. caulking
12. glass fiber

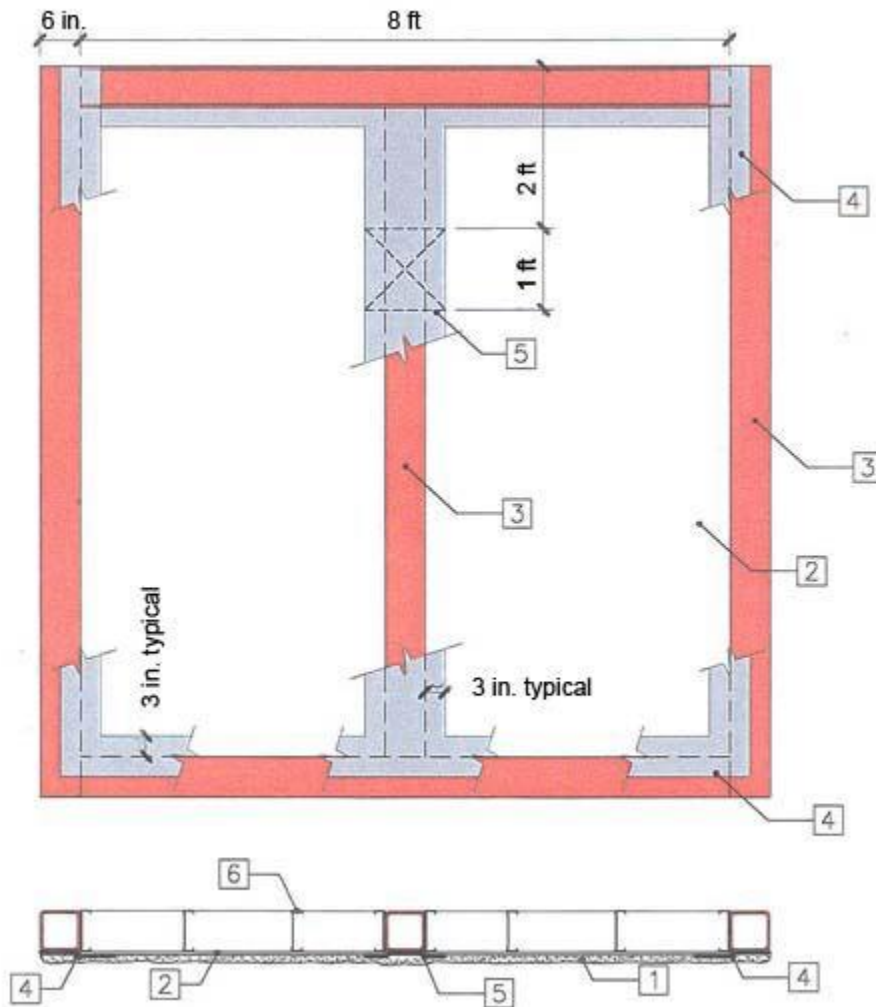


Figure A-3. Specimen No. 3: Example of continuity across joints with transition membrane in gypsum and metal stud infill wall with a steel frame

1. 25.4-mm-thick “WALLTITE® v.3” spray urethane foam installed over surface of wall
2. exterior gypsum board
3. steel frame
4. peel-and-stick bituminous membrane with primer
5. peel-and-stick bituminous membrane without primer
6. 20 ga. steel stud

All construction, control or expansion joints in an exterior wall assembly must be bridged by a transition membrane as part of the “WALLTITE® v.3 - Air Barrier System.”

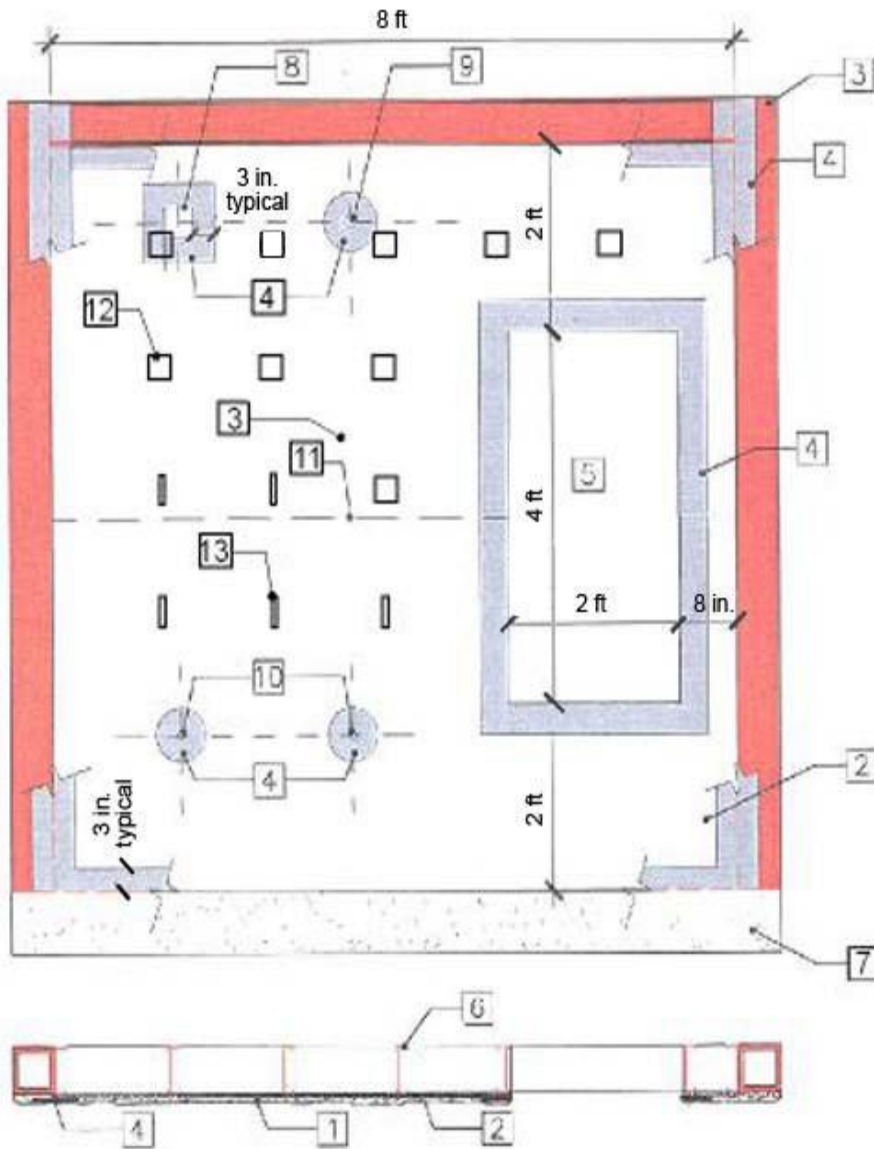


Figure A-4a. Specimen No. 2: Example of continuity across junctions and penetrations in gypsum and metal stud infill wall and at foundation wall

1. 25.4-mm-thick “WALLTITE® v.3” spray urethane foam installed over surface of wall
2. exterior gypsum board
3. exterior gypsum board
4. peel-and-stick bituminous membrane with primer
5. window opening
6. 20 ga. steel stud
7. concrete footing
8. galvanized steel duct
9. steel pipe
10. electrical conduit
11. gypsum panel joint
12. Dur-o-wall anchor
13. Bailey brick connector
14. steel frame

Since the foundation wall is designated as part of the air barrier system in this case, a transition membrane with sealant (see cross-section details) must be sealed to the foundation wall to maintain the continuity of the plane of airtightness. In addition, note that mechanical fasteners for brick veneer and penetrations from electrical wiring, pipes or ducts must be sealed through the use of a transition membrane.

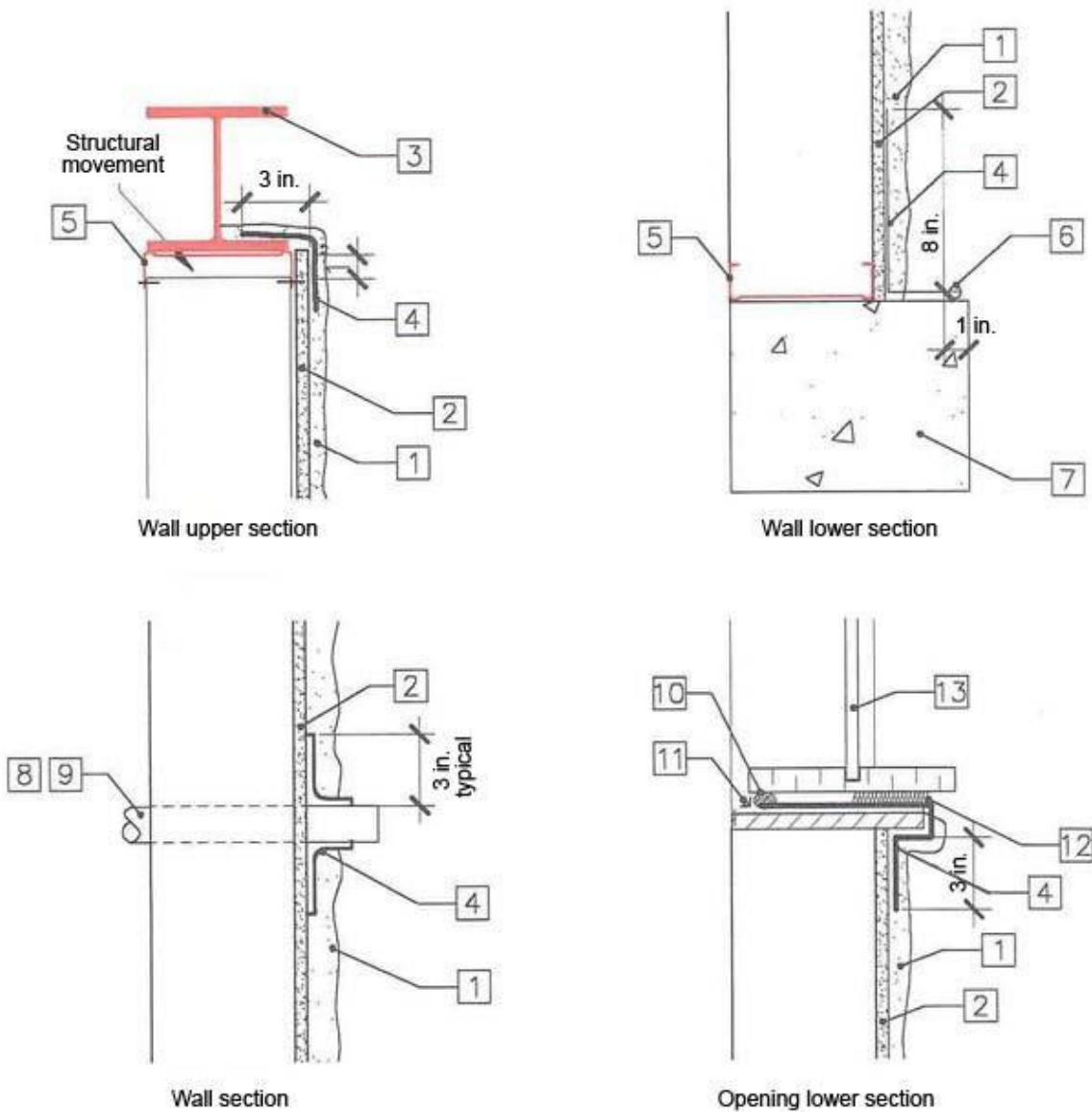


Figure A-4b. Details of transition membrane at joints between exterior sheathing wall and penetrations

1. 25.4-mm-thick "WALLTITE® v.3" spray urethane foam installed over surface of wall
2. exterior gypsum board
3. steel structure
4. self-adhesive membrane section with primer
5. 20 ga. steel stud
6. polymer base caulking strip
7. 8 in. × 10 in. concrete footing with reinforcement
8. 4 in. × 4 in. galvanized steel duct
9. 1 ½ in. dia. steel pipe
10. foam seal gasket
11. caulking
12. glass fiber
13. opening