



Evaluation Report CCMC 14131-R

HP+™ R Series - Air Barrier System

MasterFormat: 07 27 09.01
Evaluation issued: 2019-07-29

1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “HP+™ R Series - Air Barrier System,” when used as an air barrier system (ABS) for exterior walls of buildings that fall under the provisions of Part 9 and in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code (NBC) of Canada 2010 and 2015:

- Clause 1.2.1.1(1)(a) of Division A, as an acceptable solution from Division B:
 - 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)
 - Sentence 9.36.2.9.(1)(b), Airtightness (exterior walls only)
- 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)

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 (XXXXX-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 ABS as specified by BASF. The “HP+™ R Series - Air Barrier System” consists of the following components and accessories:

- principal material in the plane of airtightness: “WALLTITE® v.3”⁽¹⁾ spray polyurethane foam insulation by BASF (CCMC 13588-L);
- accessories for continuity:
 - “3M™ Air and Vapour Barrier 3015,” a self-adhering, proprietary elastomeric flashing with acrylic adhesive that is manufactured by 3M Canada for use as a transition membrane⁽²⁾ over construction, control and expansion joints, at junctions between different assemblies, and at penetrations; and
 - “MasterSeal® NP 1™” by BASF or “Dymonic® 100” by Tremco, for use at membrane-to-foundation junctions and on the interior side around window and door openings; and
- component for wind load resistance: structural substrate, such as “Neopor® Graphite Polystyrene (GPS)⁽³⁾ by BASF, oriented strand board (OSB), plywood, or exterior gypsum sheathing within a wall designed to withstand the anticipated positive and negative wind loads.⁽⁴⁾

If installed as part of the designated ABS, “WALLTITE® v.3” spray polyurethane foam serves a dual function in the wall assembly: as the principal plane of airtightness of the designated ABS 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 to install the product. The resulting product is a Type 2 spray polyurethane 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 proprietary ABS, 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.

- (1) “WALLTITE® CM01” is deemed to be an adequate foam option when installed with a minimum field density (also called “in-place density”) of 39 kg/m³ for air barrier application. The use of “WALLTITE® CM01” as a thermal insulation is evaluated in CCMC 14100-L.
- (2) The original full-scale testing was carried out with one proprietary transition membrane. Other proprietary membranes are qualified for use by BASF through a small-scale tension test (i.e. “WALLTITE® v.3”-sprayed specimens over various substrates) to ensure the equivalent adhesion is maintained.
- (3) “Neopor® Graphite Polystyrene (GPS)” has demonstrated compliance with CAN/ULC-S701-11, “Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering,” based on QAI Laboratories’ Building Products Listing Program. Packaging must be labeled with the QAI certification mark.
- (4) Note that lateral loads due to wind are not within the scope of this evaluation. Requirements for braced walls outlined in Part 9 of the NBC 2015 apply to lateral loads.

3. Conditions and Limitations

CCMC’s compliance opinion in Section 1 is bound by the “HP+™ R Series - Air Barrier System” being used in accordance with the conditions and limitations set out below.

3.1 Air Barrier System

- The durability assessment of “WALLTITE® v.3” (the principal material of the ABS) has demonstrated sufficiently low air permeance at a thickness of 25.4 mm and a minimum field (in-place) density of 39 kg/m³. This meets the intent of Subsection 9.25.3., Air Barrier Systems, of Division B of the NBC 2010 and 2015 for buildings with an indoor relative humidity (RH) of 35% or less. For buildings with a higher RH (e.g., swimming pools and museums), additional assessment is required in accordance with Part 5, Environmental Separation, of Division B of the NBC 2010 and 2015.
- The evaluation of “HP+™ R Series - Air Barrier System” is limited to wood-frame construction that meets the requirements of Part 9, Housing and Small Buildings, of Division B of the NBC 2010 and 2015. The air leakage rate of the tested wall assemblies, following structural aging, meets the rating A1 (less than 0.05 L/(s·m²) at a pressure difference of 75 Pa) when tested in accordance with CAN/ULC-S742-11, “Air Barrier Assemblies – Specification.” The wall assemblies⁵ have demonstrated sufficient strength to resist wind loads so they can be used in buildings that fall under the provisions of Part 9 of the NBC 2010 and 2015, in geographical locations where the wind pressure is $Q_{1/50} \leq 1\,000$ Pa for a maximum building height of 12 m. The $Q_{1/50}$ corresponds to the 1-in-50-year wind pressure return period published in Appendix C of Division B of the NBC 2010 and 2015. For applicability of the ABS rating and durability of the components, in wood-frame construction beyond the provisions in Part 9 of the NBC 2010 and 2015, the stamp of an engineer is required for acceptance by the authorities having jurisdiction (AHJs).
- To provide the air leakage control and strength in the field, the product must be installed in conformance with the limits above. It must be installed in the field by Caliber Quality Solutions Inc.-certified installers according to “HP+™ R Series walls - Technical Installation - 3D details - version 2019”, “HP+™ Wall System R Series Field Assembly Guide dated May 30, 2019” and “HP+™ R Series Installation Details dated April 8, 2019.” Caliber Quality Solutions Inc., a third-party inspection agency, must conduct the necessary follow-up inspections to ensure that Caliber Quality Solutions Inc.-certified installers are performing the necessary field quality control; for example, transition membrane application, membrane adhesion / pull testing before spraying, sealant application before spraying, and 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 Quality Solutions Inc. daily worksheet for the “HP+™ R Series - 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 “WALLTITE® v.3” installers must present their Caliber Quality Solutions Inc. identification card upon request by the building official.
- The product must be identified with the manufacturer’s name or logo and the phrase “CCMC 14131-R.”

- (5) Neopor® Graphite Polystyrene (GPS) sheathing has been installed with 65.5-mm-long pneumatic hammer nails with 44.5-mm-diam plastic caps. Nail spacing is 150 mm along the sheet edges and 203 mm in the field of the panel on the studs.

3.2 Air Barrier System - Field Quality Assurance

This product is required to be installed as outlined in “HP+™ Wall Quality Assurance Program Handbook” by BASF.

When the “HP+™ R Series” is applied as the designated ABS, BASF requires that the installer be BASF-trained and that Caliber Quality Solutions Inc. conducts periodic 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-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 ABS installation.

3.3 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 trained by BASF, with field inspections carried out by Caliber Quality Solutions Inc. Caliber Quality Solutions Inc. certifies BASF’s training program and provides follow-up inspections to ensure installations are in accordance with CAN/ULC-S705.2.

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 Caliber Solutions Inc. licensing card and their daily work record upon request by the building official.

Note:

The BASF 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 (866-474-3538) and request an inspection for a specific job site if they deem it necessary. In cases where the installation is found to be non-conforming by Caliber Quality Solutions Inc./BASF and where the non-conformance is not remedied by the installer, Caliber Quality Solutions Inc./BASF 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 XXXXX-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, 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 ABS.

To qualify, a conforming ABS 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	S742 Classification ⁽¹⁾	Air Leakage Rate After Wind Loading at 75 Pa ΔP	Air Leakage Rate After Wind Loading at -20°C and at 75 Pa ΔP ⁽²⁾	Requirement ⁽³⁾
HP+™ R Series	A1 ⁽³⁾ (≤ 0.05 L/(s·m ²))	0.016 L/(s·m ²)	0.020 L/(s·m ²)	Pass

Notes to Table 4.1.1:

- (1) The air leakage rate of the specimens was determined after structural aging of the ABS. Aging of the ABS was conducted to qualify it for various $Q_{1/50}$ design structural wind loads. For the stud wall, the ABS was subjected to a loading schedule involving: one-hour sustained positive and negative pressure set at 1 000 Pa; 2 000 cycles (two stages of 1 000 cycles) of positive and negative pressure set at 1 460 Pa; wind gust of positive and negative pressure set at 2 180 Pa; and deflection loading at ±1 460 Pa for ten seconds.
- (2) The air leakage rate was determined in accordance with ASTM E1424, “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 Table 4.1.2 for the 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 2010 and 2015 with regards to ABS performance.

Table 4.1.2 Permissible Air Leakage Rate

Water Vapour Permeance (WVP) 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 ≤ 60	0.05
60 < WVP ≤ 170	0.10
170 < WVP ≤ 800	0.15
> 800	0.20

For more information on the CCMC Technical Guide requirements and how they relate to the NBC 2010 and 2015 requirements, please see the IRC Publication, *Air Barrier Systems for Walls of Low-Rise Buildings: Performance and Assessment*, ISBN 0-60-16862-6.

4.1.2 Durability of Air Barrier System Components

Table 4.1.2.1 Results of Durability Testing of Components in the “WALLTITE® v.3 Air Barrier System”

Component	Requirement	Result	
Spray-applied polyurethane foam insulation:	“WALLTITE® v.3” polyurethane insulation	Air permeance before and after aging (ASTM D726-84): < 10% increase	Passed
		Thermal resistance after heat aging and weathering: 90% retention	Passed
Transition membrane:	3M™ Air and Vapour Barrier 3015 by 3M	Physical properties before and after aging: 85% retention	Passed
Sealant:	“MasterSeal® NP 1™” by BASF or “Dymonic® 100” by Tremco	Complies with ASTM C920-14	Passed

5. Additional Data

Data in this section does not form part of CCMC's opinion in Section 1.

The following test data are provided for information purposes only, as CCMC's opinion of the product's compliance with NBC 2010 and 2015 stated in this Report is limited to a maximum building height of 12 m for buildings that fall under the provisions of Part 9 of the NBC 2010 and 2015. For the applicability of the ABS rating and durability of the components, in wood-frame construction beyond the provisions in Part 9, the stamp of an engineer is required for acceptance by the authorities having jurisdiction (AHJs).

The third-party testing laboratory that conducted the air leakage tests in compliance with CAN/ULC-S742 also reported the following sustained hourly wind pressure loads and its corresponding building heights (see Table 1 in Annex G of CAN/ULC-S742) other than 12 m:

1. $Q_{1/50}$ sustained hourly wind pressure load 0.450 kPa (450 Pa) and building height of 60 m;
2. $Q_{1/50}$ sustained hourly wind pressure load 0.550 kPa (550 Pa) and building height of 20 m;
3. $Q_{1/50}$ sustained hourly wind pressure load 0.650 kPa (650 Pa) and building height of 20 m;
4. $Q_{1/50}$ sustained hourly wind pressure load 0.750 kPa (750 Pa) and building height of 20 m; and
5. $Q_{1/50}$ sustained hourly wind pressure load 0.850 kPa (850 Pa) and building height of 20 m.

The tested wall specimens did not lose their integrity during the wind pressure loading.

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Date modified:
2019-08-08

APPENDIX A

A-1 Specimens Tested for Qualifying System Details

Figures A-1 to A-2c outline the original full-scale specimens tested with “WALLTITE® v.3” spray polyurethane, which represent typical construction details to be reproduced in the field as part of the installation of BASF’s proprietary “HP+™ R Series - Air Barrier System.”

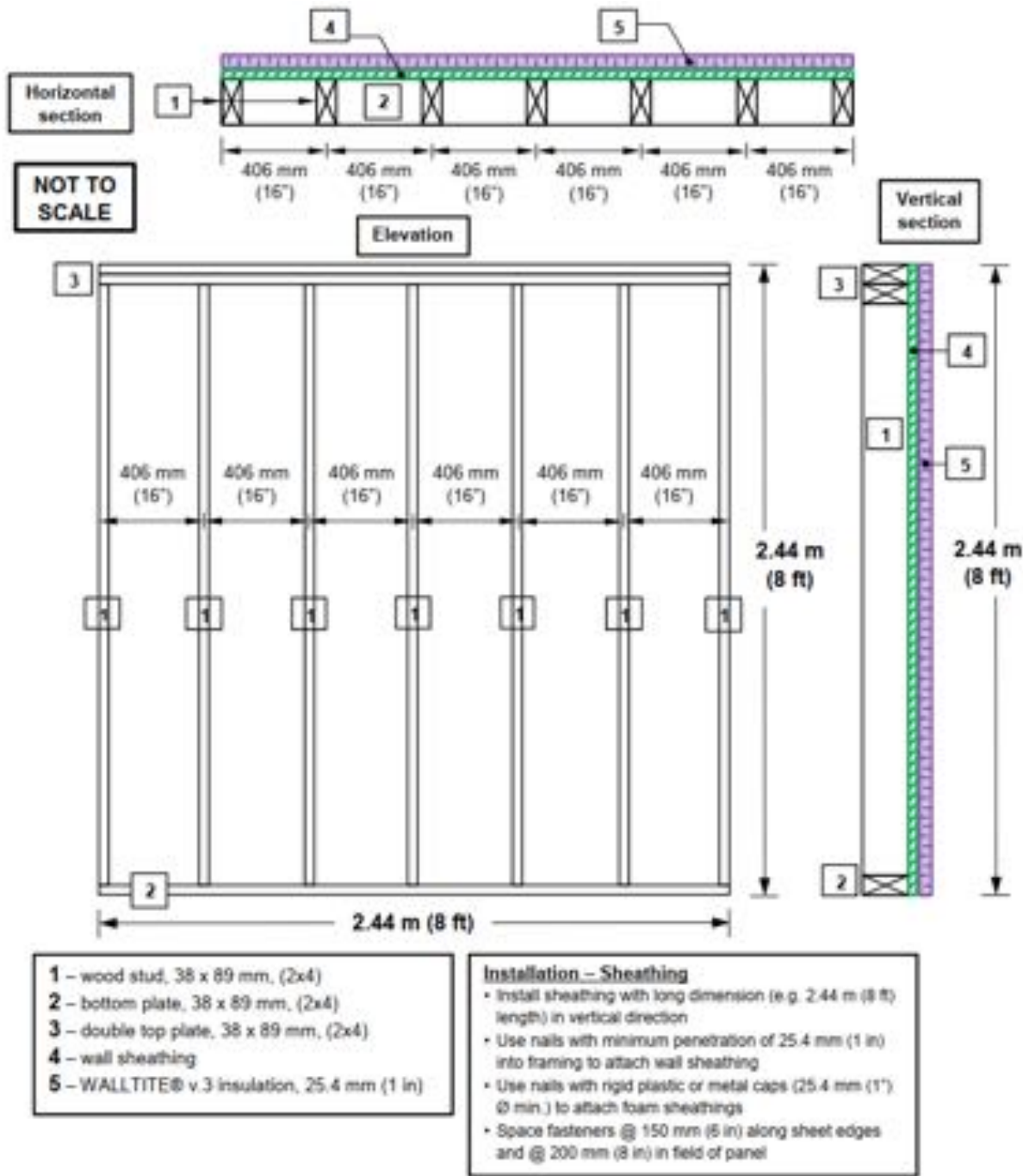


Figure A-1. Specimen No. 1: opaque wall assembly

All construction, control or expansion joints in an exterior wall assembly must be bridged by a transition membrane as part of the “HP+™ R Series - Air Barrier System.”

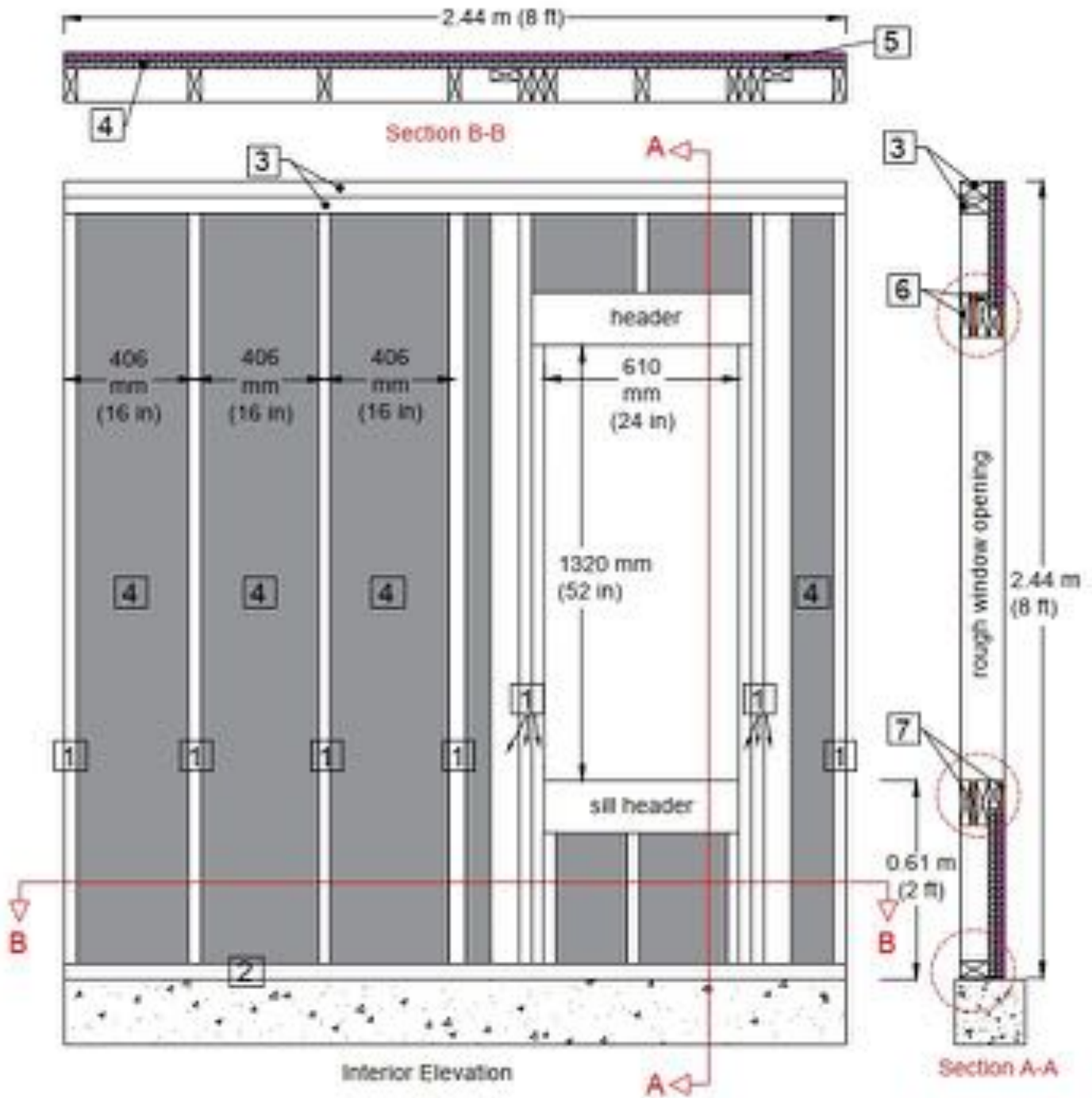


Figure A-2a. Specimen No. 2: example of continuity across junctions and penetrations in the wall and at the foundation wall. This specimen includes veneer anchors, various type of pipes, and a 100 mm × 100 mm (4 in. × 4 in.) galvanized steel duct (see details in Figures A-2c and A-2d).

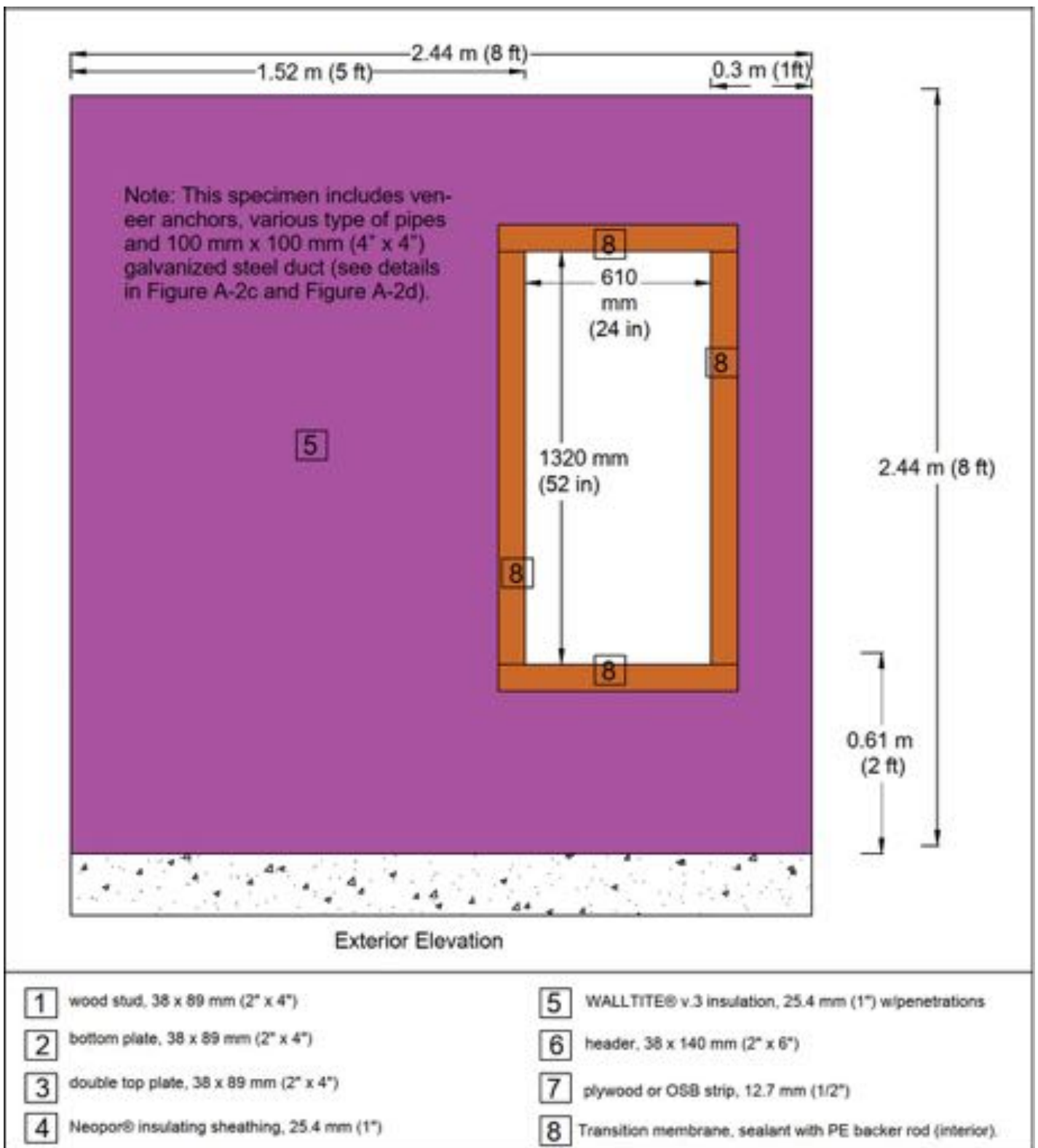


Figure A-2b. Specimen No. 2: example of continuity across junctions and penetrations in the wall and at the foundation wall. This specimen includes veneer anchors, various type of pipes, and a 100 mm × 100 mm (4 in. × 4 in.) galvanized steel duct (see details in Figures A-2c and A-2d)

Since the foundation wall is designated as part of the ABS 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, mechanical fasteners for brick veneer and penetrations from electrical wiring, pipes or ducts must be sealed with the use of a transition membrane.

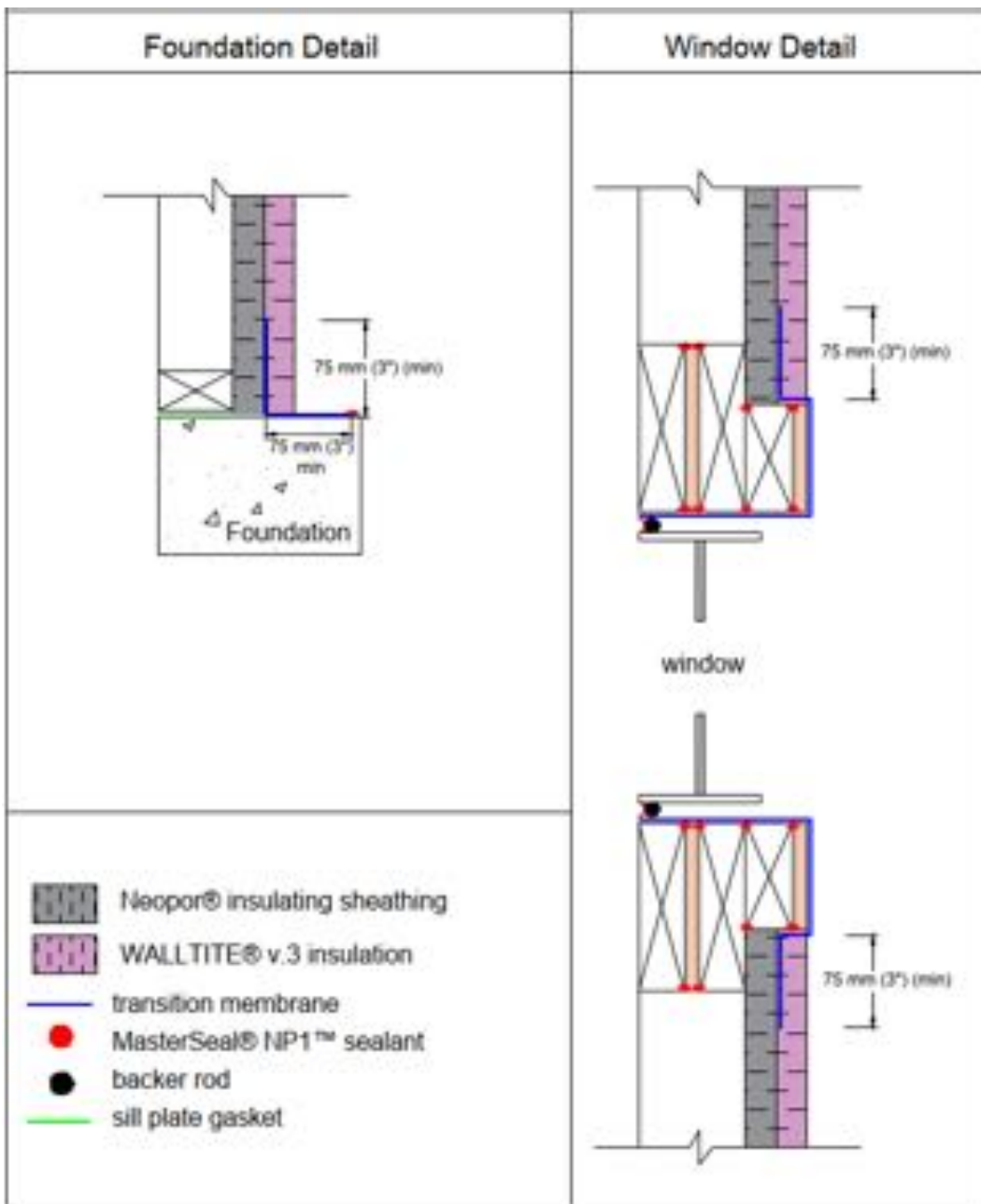


Figure A-2c. Details of transition membrane at the foundation wall junction and the window opening

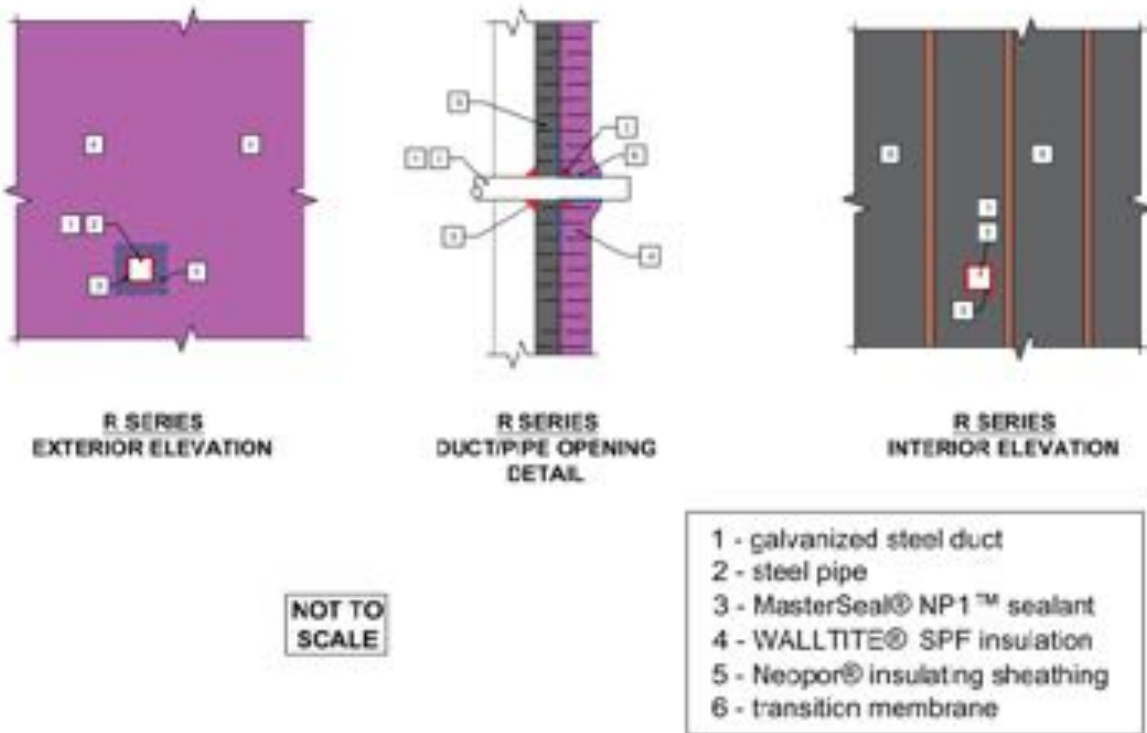


Figure A-2d. Details of transition membrane around the wall penetrations