Evaluation Report CCMC 14030-R
Insulthane® Extreme Air Barrier System

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1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that "Insulthane® Extreme 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 2010:

- Clause 1.2.1.1.(1)(b), 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:
  - Subsection 9.25.3., Air Barrier Systems

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

Ruling No. 17-06-343 (14030-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 2017-06-26 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 Evaluation Report addresses the performance of the product as an air barrier system as specified by Elastochem Specialty Chemicals. The product consists of the following components and accessories:

- principal material in the plane of airtightness: "Insulthane® Extreme" medium density, spray-applied polyurethane foam;
- accessories for continuity:
  - "Blue Skin SA®," a modified bituminous membrane (i.e., peel-and-stick or thermally fused) manufactured by Henry® Company for use as a transition membrane over construction, control and expansion joints, at junctions between different assemblies and at penetrations;
  - backer rod, a closed cell foam weather stripping manufactured by Tago® for use as a gap filler around penetrations (gaps are limited to 1 in. in width), adhered and sealed with "BES 925" flexible polymeric moisture-cured sealant, manufactured by Henry® Company; and
  - specified sealants that conform to CAN/CGSB-37.29-M89, "Rubber-Asphalt Sealing Compound," for use at membrane-to-foundation junctions and conforming to CAN/CGSB-19.0-M77, "Methods of Testing Putty, Caulking and Sealing Compounds," for use on the interior side around window and door openings; and
- component for strength: structural substrate, such as concrete block, exterior gypsum sheathing, oriented strandboard (OSB), or plywood sheathing, within a wall designed to withstand the anticipated loads.

If installed as part of the designated air barrier system, "Insulthane® Extreme" medium density, spray-applied polyurethane 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 13697-L.

The foam insulation consists of two components: a polyisocyanate (A-side) and a polyurethane resin (B-side). The two components are mixed on-site by an installer approved by Elastochem Specialty Products to install the product. The resulting product is a Type 2 medium

density, spray-applied polyurethane foam with an assigned long-term thermal resistance value of 2.1 m^2•°C/W per 50 mm of thickness. If the foam insulation serves as the principal component in the "Insulthane® Extreme 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 13697-L, the colour of the finished product is burnt sienna.

3. Conditions and Limitations

CCMC's compliance opinion in Section 1 is bound by the "Insulthane® Extreme Air Barrier System" being used in accordance with the conditions and limitations set out below.

Air Barrier System

The air barrier system has demonstrated sufficiently low air permeance when it has a thickness of 25.4 mm and a minimum field density of 39.1 kg/m^3, which meets the intent of Section 5.4., Air Leakage, and Subsection 9.25.3. of Division B of the NBC 2010 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 of the NBC.

The structural wind loading conducted qualifies the air barrier system for use in low-rise buildings in geographical locations where the Q_{50} value does not exceed 0.60 kPa (the Q_{50} value is the hourly wind pressure for a 1-in-50 year return period, which can be found in Appendix C of the NBC 2010).

To control condensation where the air barrier system's insulation material has low air and vapour permeance and is installed on the cold side of the wall assembly, the interior vapour barrier must comply with Article 9.25.4.2., Vapour Barrier Materials, of Division B of the NBC 2010. The insulation material must be installed at a 25.4-mm or greater thickness to comply with Article 9.25.5.2., Position of Low Permeance Materials, of Division B of the NBC 2010 for the respective geographical location.

To control air leakage, the proposed air barrier system must be a minimum 25.4 mm thick and installed as exterior insulation over exterior sheathing or a masonry back-up wall.

The product must be installed on-site by Elastochem Specialty Chemicals trained installers following the Elastochem Specialty Chemicals specified product installation manual, which contains detailed construction drawings which must be followed (see Appendix A of this Report for examples). In addition, Urethane Foam Consultants (UFC) carries out follow-up inspections of the installations on a periodic basis.

Air Barrier System – Field Quality Assurance

When the "Insulthane® Extreme" medium density, spray-applied polyurethane foam is applied as the designated air barrier system, Elastochem Specialty Chemicals requires that the installer be trained and that UFC conduct audits to ensure:

1. that the approved accessories are being used;
2. proper installation of the transition membrane by conducting periodic tension testing as part of the Elastochem Specialty Chemicals 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 "Insulthane® Extreme" spray foam; and
5. that daily work records are maintained for the air barrier system installation.

Insulation – Field Quality Assurance

When the proposed medium density, spray-applied polyurethane foam is applied as spray-foam insulation, the material must be manufactured on-site by qualified installers licensed by Elastochem Specialty Chemicals with field inspections carried out by UFC. UFC certifies the Elastochem Specialty Chemicals training program and provides follow-up inspections to ensure installations are in accordance with CAN/ULC-S705.2-98, "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 UFC licensing card and specific site worksheet upon request by the building official.

Note: The Elastochem Specialty Chemicals 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 Elastochem Specialty Chemicals at (519) 754-1678 to request an inspection for a specific job site, if they deem it necessary. In cases where the installation is deemed non-conforming by UFC or Elastochem Specialty Chemicals and is not remedied by the installer, UFC will inform the owner/architect/building official and CCMC of the non-conforming installation.

See CCMC 13697-L for additional limitations on the installation of the "Insulthane® Extreme" medium density, spray-applied polyurethane foam product.

The polyisocyanate and polyurethane resin components of "Insulthane® Extreme" must have their containers (i.e., drums) identified by the phrases "CCMC 14030-R" and "CCMC 13697-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

Testing the product was conducted on four representative specimens. The results are summarized in Tables 4.1.1 and 4.1.2. The performance resulting from these tests has been deemed applicable to "Insulthane® Extreme 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.

4.1.1 Air Leakage Rate

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

Type of Wall Tested	Maximum Air Leakage Rate,[1] L/(s·m^2) @ 75 Pa ΔP	Result
Masonry walls (see Figures 1 and 2 in Appendix A of this Report)	≤ 0.05[2]	0.0088 L/(s·m^2)[2]
Exterior gypsum/metal stud walls (see Figures 3 and 4 in Appendix A of this Report)		0.0096 L/(s·m^2)[2]

Notes to Table 4.1.1:

1 The air leakage rate of the specimens is determined after the structural wind loading (Q_{50} = 0.6 kPa) in order to represent structural aging of the air barrier system. The air barrier system was subjected to a loading schedule involving one-hour sustained positive and negative pressure set at 0.60 kPa, 2 000 cycles of positive and negative pressure set at 0.80 kPa, and a wind gust of positive and negative pressure set at 1.2 kPa.

2 The air leakage rate requirement is based on the following Table for Rate of Permissible Air Leakage developed by CCMC/NRC with input from an industry consortium. The following table is deemed to meet the intent of the NBC 2010 with regard to air barrier system performance.

Table for Rate of Permissible Air Leakage

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 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 Testing of Durability of Components in the Product

Component	Requirement	Result
"Insulthane® Extreme" polyurethane insulation	Air permeance before and after aging (ASTM D 726-84): < 10% increase	Accepted[1]
	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: "BES 925" sealant by Henry® Company	Complies with CAN/CGSB-37.29-M89	Passed
Sealant around warm side of window and door frames: backer rod foam and "BES 925" sealant	Complies with CAN/CGSB-19.0-M77	Passed

Note to Table 4.1.2:

1 The air leakage of the product increased from 0.0004 L/s·m^2 to 0.0012 L/s·m^2 after aging (an increase of 162%). However, this was deemed acceptable as the final air leakage value is still well below the maximum allowable air leakage of 0.05 L/s·m^2.

Report Holder

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Plant(s)

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Disclaimer

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Appendix A

Specimens Tested for Qualifying System Details

The following figures outline the original full-scale specimens tested, which represent typical construction details to be reproduced in the field as part of the installation of Elastochem Specialty Chemical's current proprietary "Insulthane® Extreme 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.

Exterior Steel Stud Wall (No Penetrations)

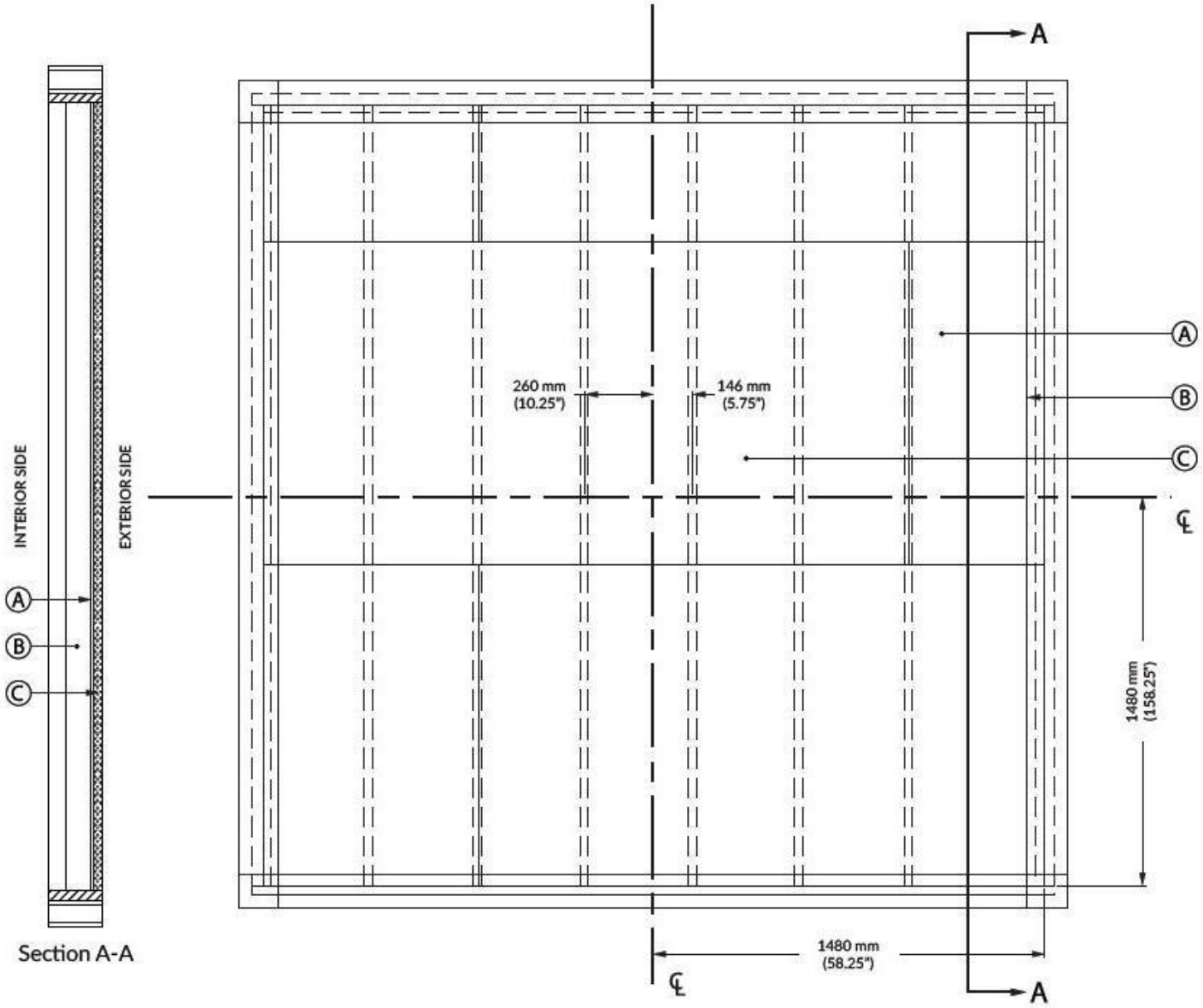

Figure 1. Exterior steel stud wall (no penetrations)

- **A. exterior sheathing 13-mm (1/2-in.) thickness fastened to steel studs with 32-mm (1-1/4-in.) SF steel drill screws (corrosion resistant) installed 102 mm (8 in.) apart**
- **B. 92-mm (3-5/8-in.) 20 ga. steel studs installed 406 mm (16 in.) on centre (o.c.)**
- **C. "Insulthane® Extreme" spray foam air barrier material**

Exterior Concrete Wall (No Penetrations)

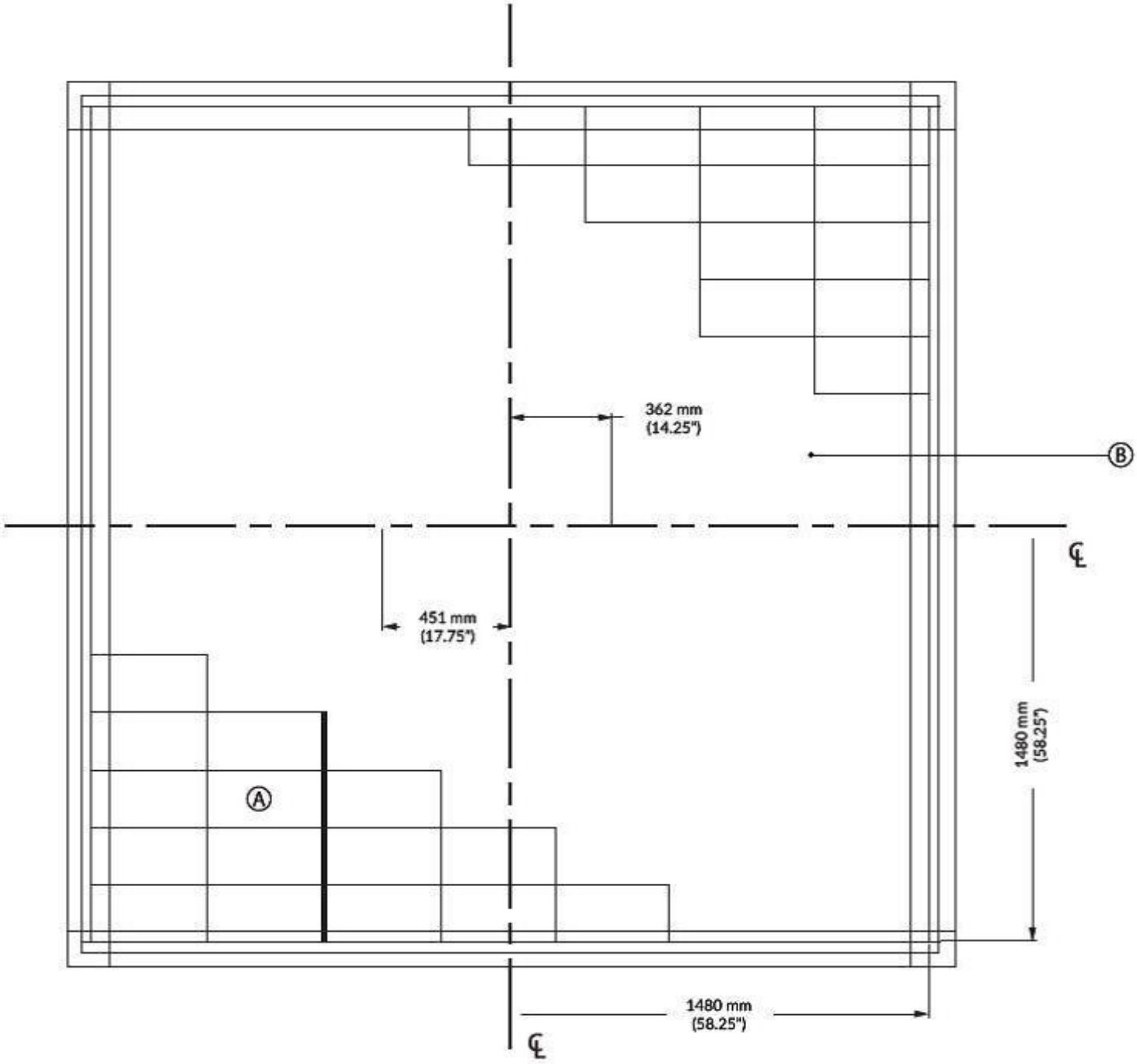

Figure 2. Exterior concrete wall (no penetrations)

A. 200-mm × 400-mm × 150-mm (8-in. × 16-in. × 6-in.) CMU block
B. Elastochem "Insulthane® Extreme" SPF application; target thickness 38 mm (1.5 in.)

Exterior Steel Stud Wall with Penetrations

All construction, control, expansion joints or penetrations in an exterior wall assembly must be bridged by a transition membrane as part of the "Insulthane® Extreme Air Barrier System."

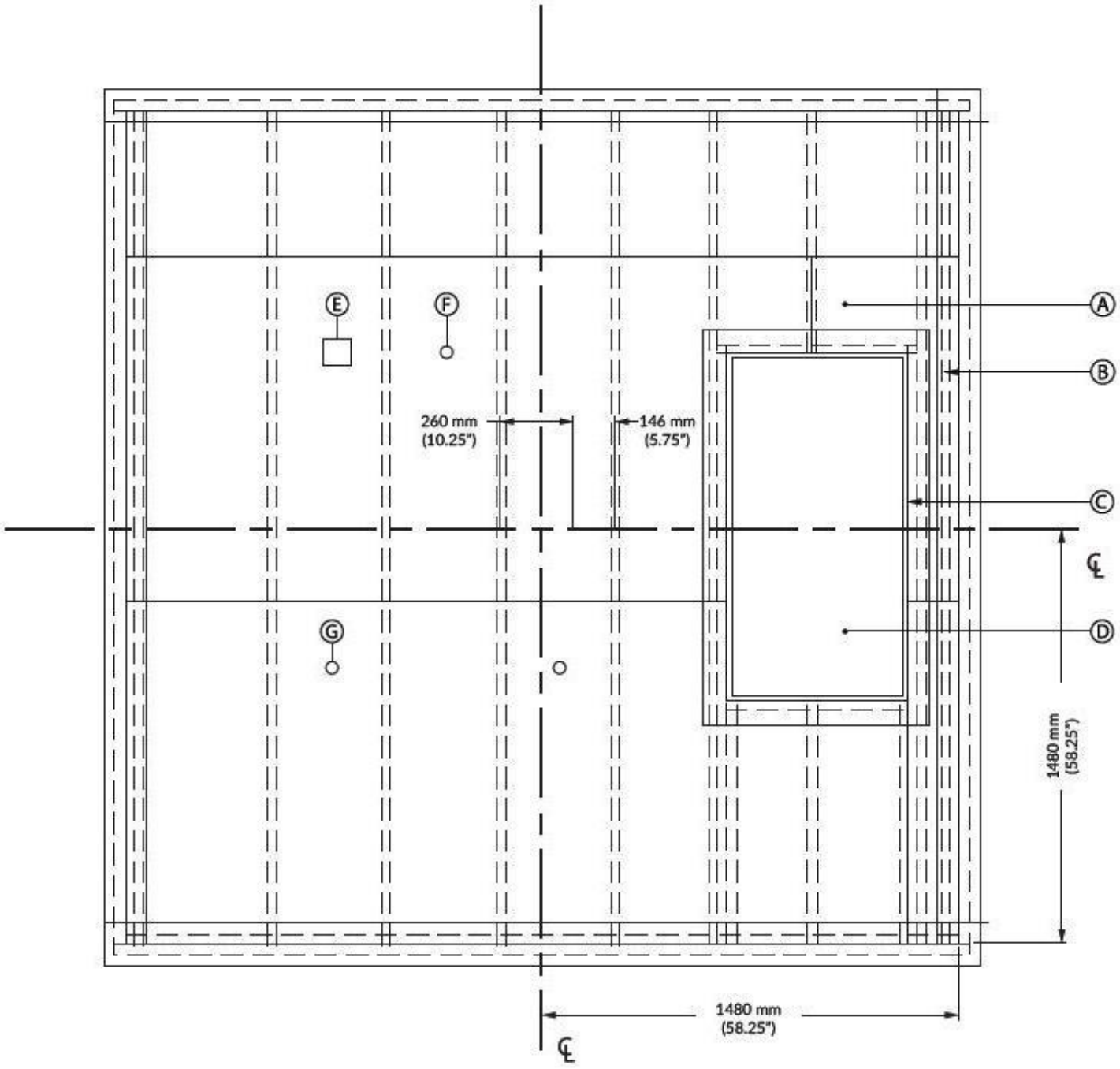

Figure 3. Exterior steel stud wall with penetrations

- **A. exterior sheathing 13-mm (1/2-in.) thickness fastened to steel studs with 32-mm (1-1/4-in.) SF steel drill screws (corrosion resistant) installed 102 mm (8 in.) apart**
- **B. 92-mm (3-5/8-in.) 20 ga. steel studs installed 406 mm o.c.**
- **C. window rough opening perimeter sealed with "Blue Skin SA®" peel-and-stick membrane, gap between window and rough opening sealed with backer rod and Henry "BES 925" sealant**
- **D. plywood window sealed with backer rod and Henry "BES 925" sealant prior to primary air barrier material (SPF) application**
- **E. 102-mm (4-in.) duct**
- **F. Ø 38-mm (1.5-in.) PVC pipe**
- **G. Ø 51-mm (2-in.) electrical conduit**

Note: PVC pipe, square duct and electrical junction boxes sealed around perimeter prior to SPF application with Henry "Blue Skin SA®" peel-and-stick membrane.

Exterior Concrete Wall with Penetrations

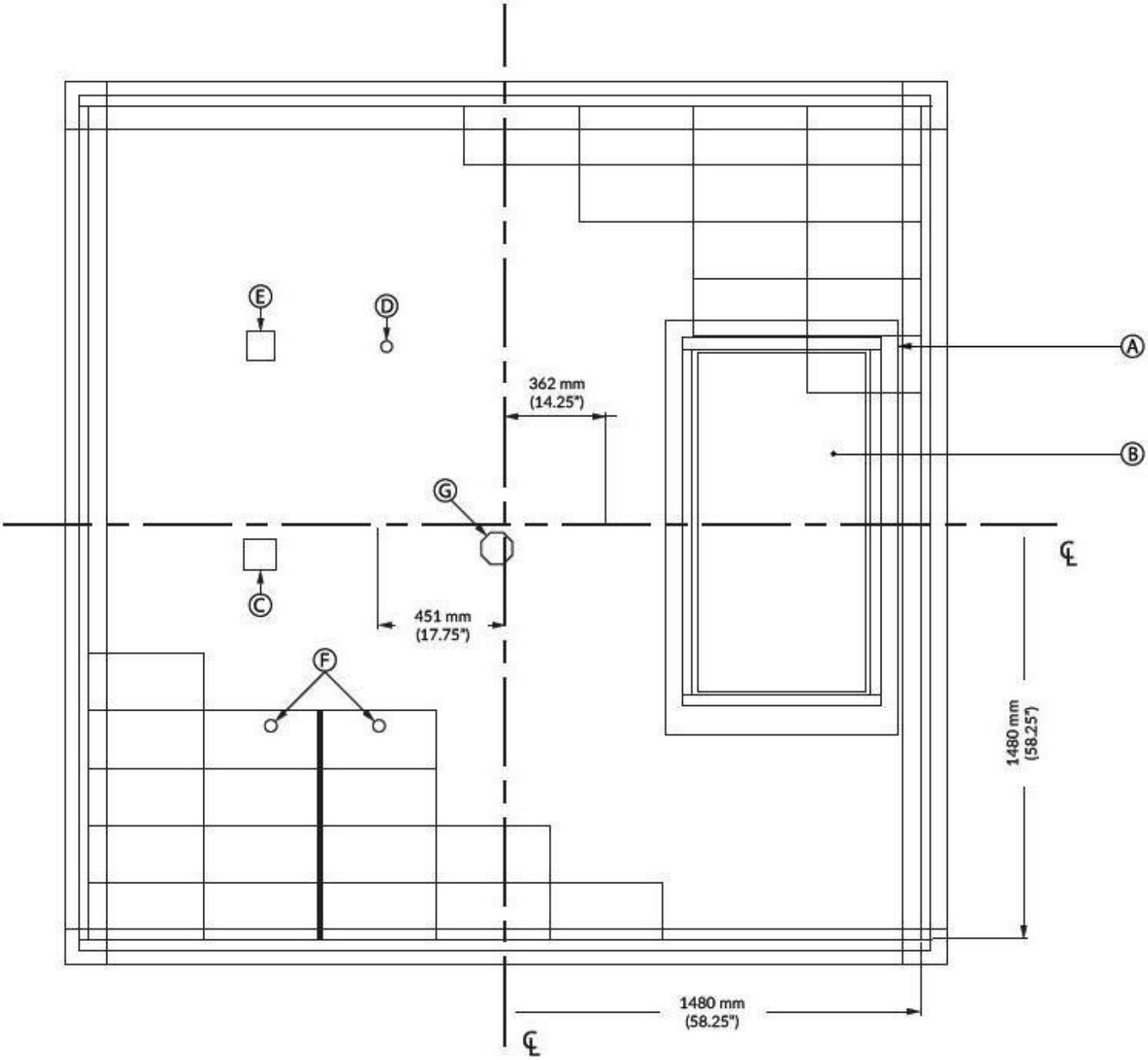

Figure 4. Exterior concrete wall with penetrations

- **A. window rough opening perimeter sealed with "Blue Skin SA®" peel-and-stick membrane, gap between window and rough opening sealed with backer rod and Henry "BES 925" sealant**
- **B. plywood window sealed with backer rod and Henry "BES 925" sealant prior to primary air barrier material (SPF) application**
- **C. 102-mm (4-in.) duct**
- **D. Ø 38-mm (1.5-in.) PVC pipe**
- **E. rectangular junction box**
- **F. Ø 38-mm (1.5-in.) conduit pipe**
- **G. hexagonal junction box**

Note: PVC pipe, square duct and electrical junction boxes are sealed around the perimeter prior to SPF application with Henry "Blue Skin SA®" peel-and-stick membrane.

Exterior Stud Wall with Foundation

As 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.

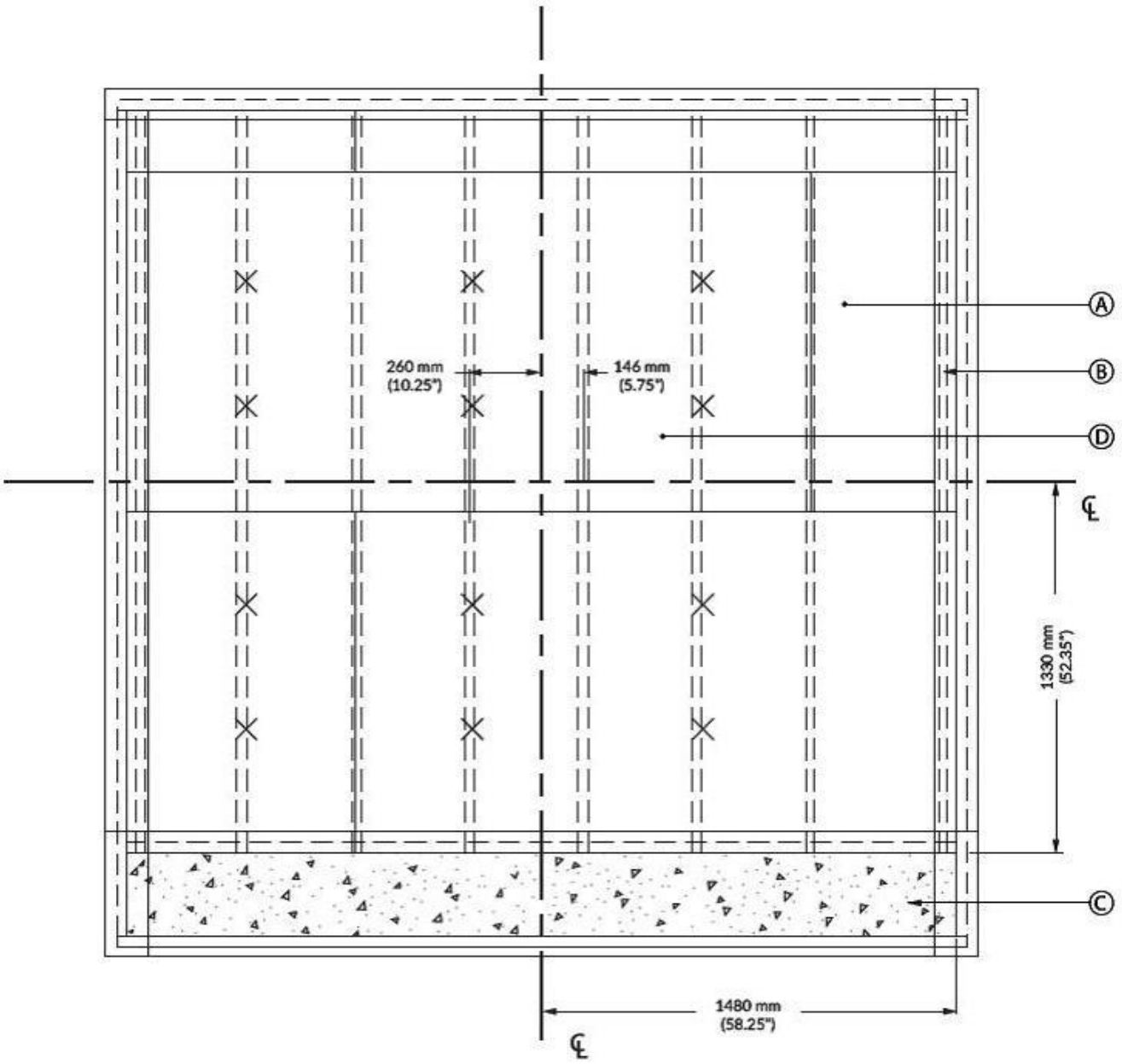

Figure 5. Exterior stud wall with foundation

- **A. exterior sheathing 13-mm (1/2-in.) thickness fastened to steel studs with 32-mm (1-1/4-in.) SF steel drill screws (corrosion resistant) installed 102 mm (8 in.) apart**
- **B. 92-mm (3-5/8-in.) 20 ga. steel studs installed 406 mm (16 in.) o.c.**
- **C. concrete foundation interface sealed on exterior with "Blue Skin SA®" peel-and-stick membrane to exterior sheathing**
- **D. Elastochem "Insulthane® Extreme" SPF application; target thickness 38 mm (1.5 in.)**
- **X. "Block-Lok BL-607" brick ties sealed around perimeter prior to SPF application with Henry "BES 925" sealant**

Exterior Concrete Wall with Foundation

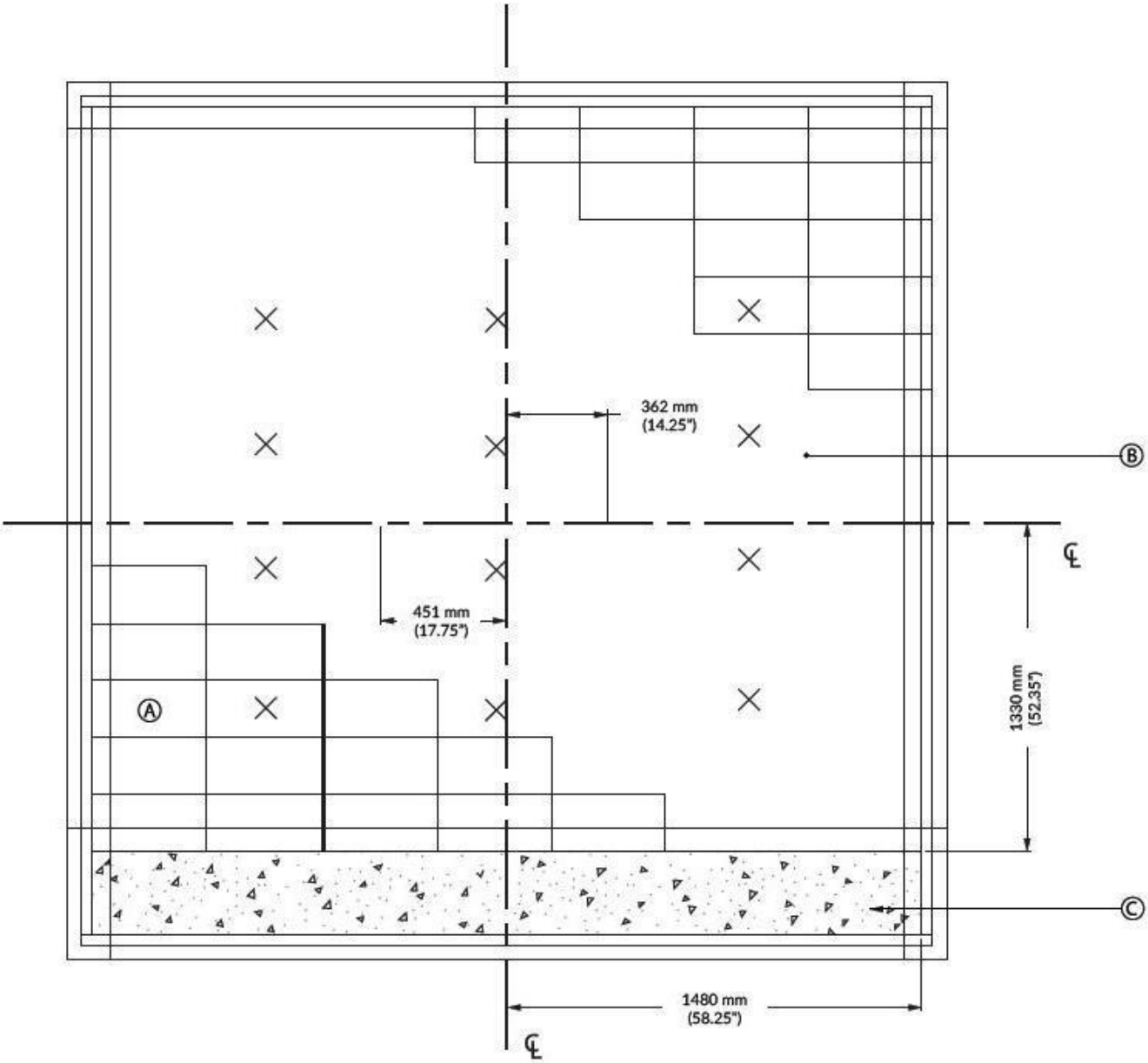

Figure 6. Exterior concrete wall with foundation

A. 200-mm × 400-mm × 150-mm (8-in. × 16-in. × 6-in.) CMU block
B. Elastochem "Insulthane® Extreme" SPF application; target thickness 38 mm (1.5 in.)
C. concrete foundation interface sealed on exterior with "Blue Skin SA®" peel-and-stick membrane to exterior sheathing
X "Block-Lok BL-607" brick ties sealed around perimeter prior to SPF application with Henry "BES 925" sealant

Penetration Details

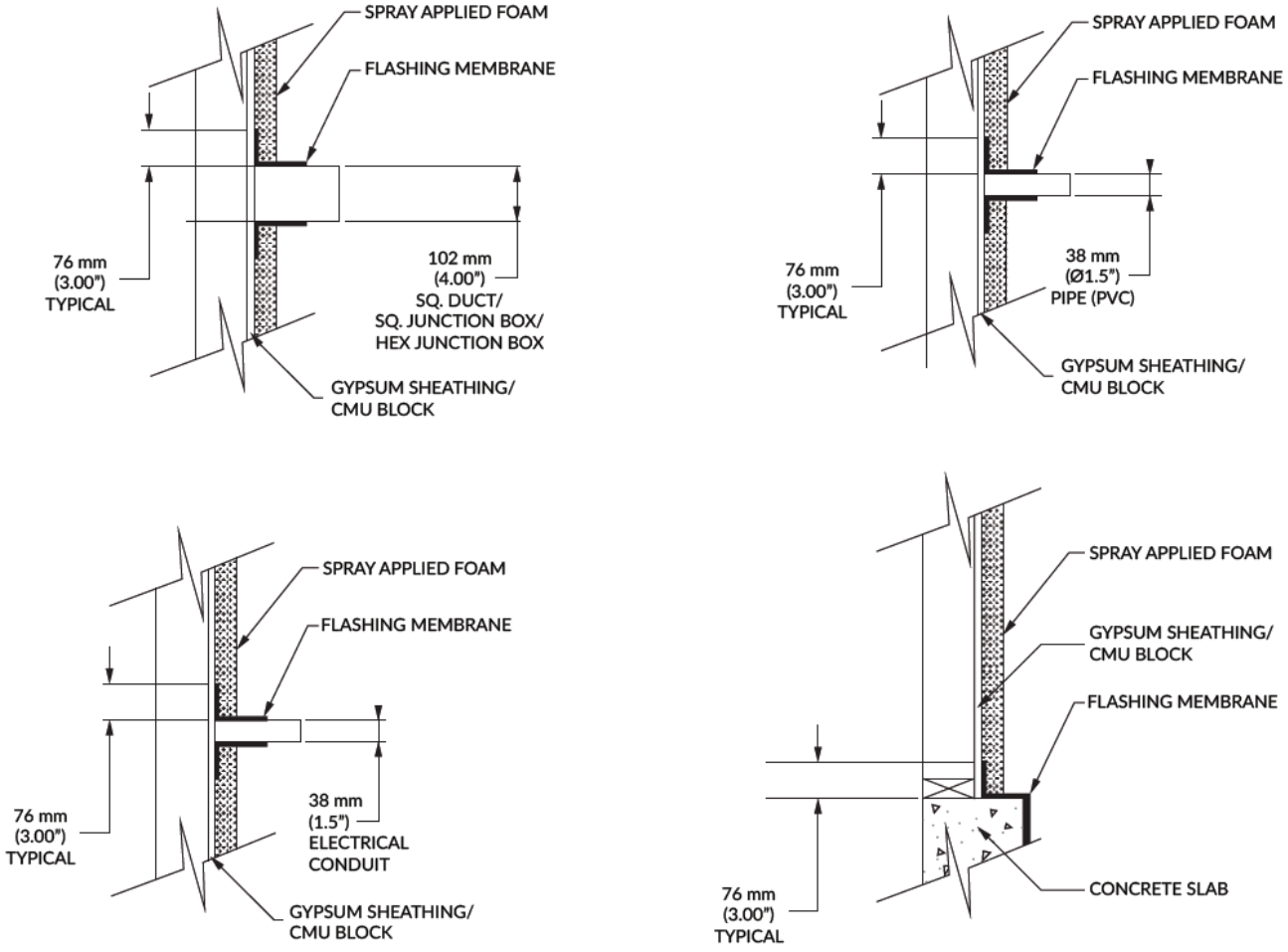

Figure 7. Penetration details

Window Sealing Details

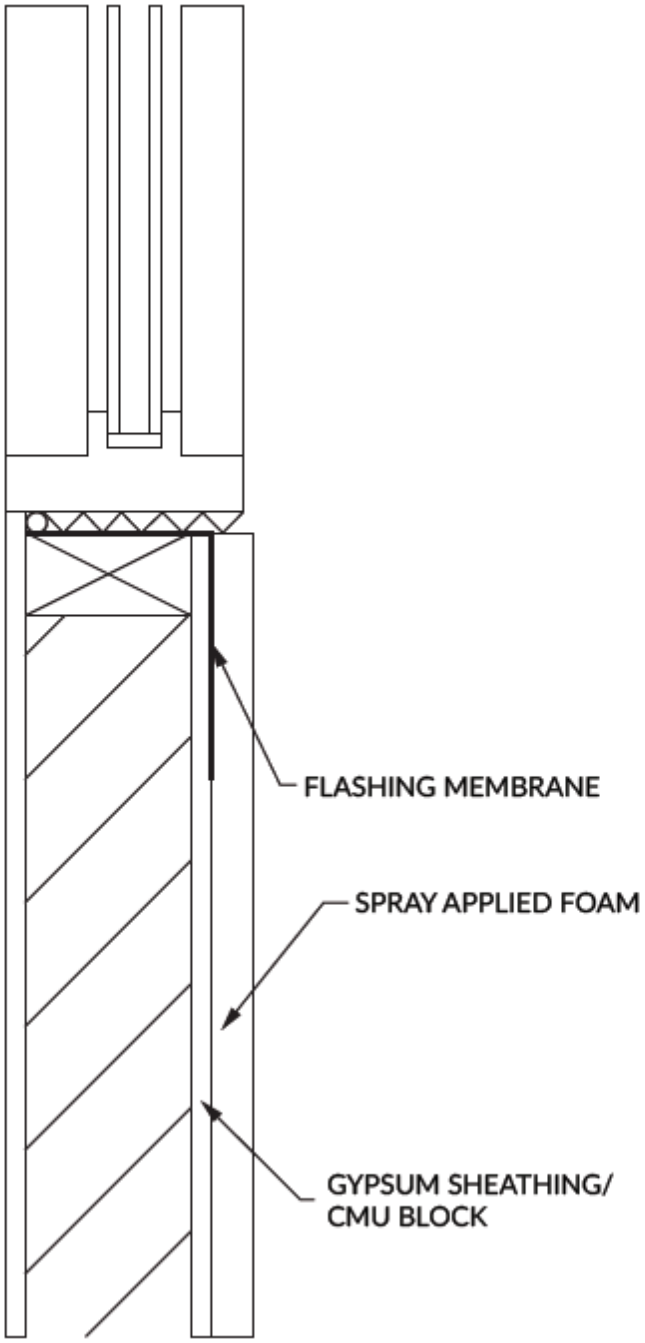

Figure 8. Window sealing details