

Standard Process for Evaluation of Air, Water-Resistive and Air/Water-Resistive Barrier Materials

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Forward

The procedures used to develop this document and those intended for its further maintenance are described P-114-017 rev 4 ABAA Policy for Balloting Official ABAA Documents.

Please submit any questions or any feedback on this document to abaa@airbarrier.org.

Introduction

For air and water-resistive barrier materials to perform as intended when installed on a building, the air and water-resistive barrier material needs to have certain characteristics and provide a level of performance for the materials as established in the ABAA Material Specification for the type of air barrier, water-resistive barrier, or air and water-resistive barrier material. In addition, integration of air barrier materials with other air barrier components and service penetrations, with the use of air barrier accessories, is critical for the in-service performance of air barrier assemblies and air barrier systems. This document also outlines the process for evaluating air leakage characteristics in air barrier assemblies for both wall and roofing applications.

The ABAA Technical Committee has approved the criteria included in this document through the ABAA document approval process.

1 Scope

This document provides a consistent, documented process for the Air Barrier Association of America (ABAA) evaluation of air barrier materials, water-resistive barrier materials, and air and water-resistive barrier materials, accessories and assemblies. This document defines the requirements and outlines the process for a supplier to have a material, accessory or assembly evaluated by ABAA.

Suppliers who conform to all the requirements of this document can request the material to be listed on the ABAA website under “Evaluated Air Barrier Assemblies” and included in the appropriate ABAA Master Project Specification.

The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch/pound units that are provided for information only and are not considered standard.

The testing and evaluation of a material against this document may require the use of materials and/or equipment that could be hazardous. This document does not purport to address all the safety aspects associated with its use. Users of this document has the responsibility to consult the appropriate authorities and to establish appropriate health and safety practices in conjunction with any existing applicable regulatory requirements prior to its use.

2 Normative References

The following documents are referred to in the text in such a way that some or all the content constitutes the requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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ASTM C390, *Standard Practice for Sampling and Acceptance of Thermal Insulation Lots*

ASTM D8052, *Standard Test Method for Quantification of Air Leakage in Low-Sloped Membrane Roof Assemblies*

ASTM E96/E96M-21, *Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials*

ASTM E631, *Standard Terminology of Building Constructions*

ASTM E1680, *Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems*

ASTM E2178-21a, *Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials*

ASTM E2357, *Standard Test Method for Determining Air Leakage of Air Barrier Assemblies*

3 Terms and Definitions

The terms and definitions given in ASTM E631—and the following—apply to this document.

3.1

accredited testing laboratory

organization accredited to ISO 17025 by a member of the IAF/ILAC Multilateral Agreement, possessing the necessary competence to test material to the specific test method.

3.2

air barrier accessory

materials designated to maintain airtightness between air barrier materials, air barrier assemblies, and air barrier components, to fasten them to the structure of the building, or both (e.g., sealants,

tapes, backer rods, transition membranes, nails/washers, ties, clips, staples, strapping, primers).

3.3

air barrier assembly

combination of air barrier materials and air barrier components, sealed together to reduce air leakage with the use of air barrier accessories.

3.4

air barrier component

pre-manufactured elements such as windows, doors and service elements that are installed in the building envelope which met a requirement for a maximum air leakage rate and water ingress.

3.5

air barrier material

primary substance that constitutes the air control layer in the building envelope.

3.6

air barrier supplier

entity that provides a material or product which is declared to be an air barrier material, accessory, component, or an assembly.

3.7

air barrier system

combination of interconnected materials and assemblies designed and constructed to provide a continuous barrier to air leakage through the building envelope that separates conditioned from unconditioned space or that separates adjoining conditioned space of different occupancies or uses (six sides of a building).

3.8

air leakage rate

airflow per unit time driven through a unit surface area at a defined static pressure differential across the material or assembly.

3.9

air permeance

airflow per unit time driven through a unit area at a unit static pressure difference across the material divided by the pressure difference between the two sides.

3.10

building envelope (enclosure)

combination of roof, wall and foundation assemblies comprised of materials, sub-assemblies, and components that when combined using accessories form the primary control layers to separate one environment from another environment.

3.11

membrane

material forming a selective barrier that may or may not allow passage of elements.

3.12

product change

change in the composition of a material, which results in a difference in the material properties of greater than 5 percent.

3.13

sub-assembly

subset of material(s) and accessories(s) that can be tested separately but are part of a complete building assembly.

3.14

water-resistive barrier

material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall.

4 Material Evaluation Process

The ABAA material evaluation process provides a standardized way of evaluating air barrier materials, water-resistive barrier materials, and air and water-resistive barrier materials. The ABAA Technical Committee develops a material specification for each category and type of material, providing the required material properties and performance requirements for each property within the specification.

The material specifications and performance requirement table therein specify the required values for the different material properties. These values are intended for use in specifications, material evaluations, and quality control. The property values are not intended to predict *in situ* end-use material performance, and the values will differ from those reported when tested under different conditions. The installation procedures required by the supplier may affect the materials in situ end-use performance.

ABAA provides the evaluation service for the industry and publishes information on whether the material performance has met the requirements outlined by ABAA. The user shall determine whether a material is suitable for in situ applications on a building.

ABAA has developed material requirements for an air barrier or water-resistive barrier application. In addition to resisting water or reducing airflow through the material, further material property requirements for each type of material need to be met for the material to be considered for listing by ABAA.

5 Application

The supplier shall complete a membership application form, material evaluation form, mutual nondisclosure agreement, and licencing agreement available at <https://www.airbarrier.org/air-barrier-material-evaluation/> and provide the documentation listed in Annex A.

If the supplier feels that the material does not fit into an existing material specification, the supplier may request that ABAA develop a new material specification for the proposed type of material. ABAA would consider developing a new material specification for the type of material proposed, if that material is deemed not to fit into existing material types.

ABAA will list the material on the ABAA website only when the supplier meets all material testing, assembly testing, reporting, and documentation requirements.

6 Requirements

6.1 Material Types

ABAA has developed a listing system separates materials into categories (air, water-resistive, and air and water-resistive barriers) and then types. Each material specification includes requirements that are specific to that material type. Suppliers looking to have a material evaluated by ABAA shall review the documents to see where a material may fit. The supplier can then download the material specification for that material type to determine the material property requirements. When the supplier's material type is not readily apparent, the supplier shall contact ABAA for assistance in determining the proper material type.

6.2 Material Sampling

The accredited testing laboratory determining compliance to this document is responsible for the random sampling of the material. Sampling shall be performed in accordance with the principles of ASTM C390. Randomly select enough material on a single occasion from a single lot to complete all testing to determine compliance with this document.

The supplier shall ensure that sufficient material—both in size and quantity—is available for sampling and testing.

Where additional material is required, obtain it from the same lot as the originally selected material or a lot that has the same material properties, formulation, and manufacturing process.

6.3 Thickness Tested

The thickness of the material tested shall be the same for all tests conducted following the ABAA Material Specification. Test reports' rejection will occur when different thicknesses are used for various test methods unless specifically required in the test method. If a supplier declares another thickness requirement for that material in the future, ABAA shall consider that to be new material and require documentation for the air leakage rate of the material (ASTM E2178), air leakage of the assembly [(ASTM E2357), (ASTM E1680) or (ASTM D8052)] and water vapor transmission (ASTM E96).

6.4 Testing

The testing is required to be performed by an accredited testing laboratory.

Testing shall follow the latest edition or cited edition, if indicated, of the test method. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

6.5 Material Used in Assembly Testing

When conducting assembly testing, the material installed into the wall air barrier assemblies, roof air barrier assemblies, and water-resistive barrier assemblies shall be the same evaluated material. The thickness of the material in the assembly shall be the supplier's declared installed thickness and material tested thickness. All accessories used to construct the building assembly are to be the

supplier's required accessories for the material being tested. These accessories are to be included in the test report.

7 Testing – Material

7.1 Material Specification

The material shall meet the requirements listed in ABAA Material Specification for the specific material type.

8 Testing – Assemblies

The requirements listed in this document for testing of assemblies include the tested material along with the general evaluation and documentation required by the ABAA evaluation process.

The tested material thickness shall be consistent for all material testing (material, sub-assembly, and assembly). The required installed thickness shall be equal to the thickness tested to show conformance to the material property requirements of the relevant ABAA Material Specification.

The material installed into the assembly shall be the same as used for all test reports submitted for evaluation, with no product changes. In the case of fluid-applied materials, the installed dry thickness shall equal the required dry mil thickness of the tested material.

8.1 Wall Assembly Testing

Any material that ABAA evaluates and lists on the ABAA website shall meet both the material and assembly requirements.

8.1.1 Wall Assembly Test Method

All materials shall be tested as part of a wall air barrier assembly following ASTM E2357 *Standard Test Method for Determining Air Leakage of Air Barrier Assemblies* by an accredited testing laboratory. (See **Table 1** for optional Structural Wind Loading Schedule for wind pressure conditioning.) Type 1 is the ASTM E2357 default wind pressure conditioning. The supplier may request the laboratory test at a higher type of level and have the higher type clearly identified on the report and recognized by ABAA.

8.1.2 Base Wall Assemblies

The base specimen walls, constructed by either the accredited testing laboratory or the supplier under the supervision of the accredited testing laboratory, shall follow the base wall construction instructions in Annex C. The supplier can choose which type (wood, steel stud or CMU) of backup wall to install the air barrier materials and accessories. Only one type of wall is required to be tested.

8.1.3 Wall Specimen Construction

The air barrier assembly specimen shall be constructed by installing the air barrier material and accessories on the base wall assemblies. A qualified installer shall install the materials and accessories following the supplier's installation instructions. Any additions, deletions, or deviations to the installation instructions shall be documented and provided in the test report. Installation instructions shall include information on:

- A Acceptable substrate and a list of any substrates not approved.
- B Substrate preparation for each type of substrate. Indicate when material will be directly installed onto the framing without a substrate support.
- C Ambient and substrate conditions required for installation (e.g., temperature, wind, humidity, precipitation, falling temperature, etc.).
- D Installation method (e.g., mechanically fastened, trowel on, roll on or spray on).
- E Sequence and technique details for installation, penetrations, terminations, and transitions.
- F Material compatibility listing – both mechanical and chemical.
- G Listing of acceptable primers and sealants.
- H For fluid-applied membranes – required site installed thickness that is the air barrier material tested thickness without any substrate.
- I Installation details for the assembly showing each air barrier accessory.

8.1.4 Wall Assembly Testing Requirements

The testing shall follow the procedures in ASTM E2357. Wall Specimens shall be conditioned for a minimum of 24 hours at laboratory conditions. The supplier shall use either the existing loads included in ASTM E2357 (Type 1) or may test to higher loads. The supplier may choose from the following loads.

**Table 1:
 Optional Structural (Wind) Loading Schedule for ASTM E2537
 Testing**

Type	P_1, P'_1 sustained for one hour (Pa)	P_2, P'_2 2000 cycles (Pa)	P_3, P'_3 gust wind (Pa)
1 (ASTM E2357)	600	800	1200
2	1500	2000	2400
3	2800	3800	4400
4	3100	4100	4800
5	3300	4300	5100
6	3400	4500	5300
7	3600	4700	5500

The calculated air leakage rate through the test specimen per ASTM E2357 shall not be greater than 0.20 L/s·m² at a pressure differential of 75 Pa [0.04 cfm/ft² at a pressure differential of 1.57 psf] when tested in both directions. The result shall be recorded to a minimum of three decimal places. The test report shall indicate the pressures used in the test.

8.1.5 Wall Assembly Testing Sequence

The base wall is to be constructed in accordance with Annex C Air Barrier Wall Assembly Specimens. The air barrier/water-resistive barrier material is to be installed according to the supplier's published installation instructions and to the supplier's published installation thickness. Where required, the material shall be cured. The specimen is to be tested in accordance with ASTM E2357 at the supplier's chosen structural loading pressures choose from Table 1. After completion of the test and without removing the specimen from the test apparatus, the brick ties are to be installed according to the brick-tie supplier's instructions with any additional requirements of the air/water-resistive barrier supplier's requirements. The ASTM E2357 test is to be run for a second time after the brick ties have been installed. Results of both tests are to be included.

8.2 Roof Assembly Testing

All roof air barrier materials to be evaluated by ABAA shall be incorporated into and tested as part of a roof air-barrier assembly in conformance with the latest version of the standard.

8.2.1 Roof Assembly Test Methods

Use one of the following test methods depending on the roof construction type.

- A ASTM D8052 Standard Test Method for Quantification of Air Leakage in Low-Sloped Membrane Roof Assemblies for ABAA evaluation of low-slope roof assemblies, or;
- B ASTM E1680 Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems for metal roofs.

8.2.2 Base Roof Assemblies

The base specimen roof assemblies shall be constructed following the test method specimen requirements by either the accredited testing laboratory or the supplier under supervision of the accredited testing laboratory.

8.2.3 Roof Specimen Construction

A qualified installer shall install the materials and accessories following the supplier's installation instructions. Any additions, deletions, or deviations to the installation instructions shall be documented and provided in the test report. Installation instructions shall include information on:

- A Acceptable substrate and a list of any substrates not approved;
- B Substrate preparation for each type of substrate;
- C Ambient and substrate conditions required for installation (e.g., temperature, wind, humidity, precipitation, falling temperature, etc.);
- D Installation requirements including minimum dry mil thickness for fluid-applied materials;

- E Sequence and technique details for installation, penetrations, terminations and transitions;
- F Material compatibility listing – both mechanical and chemical;
- G Listing of acceptable primers and sealants.

8.2.4 Roof Assembly Testing Requirements

Test methods ASTM D8052 or ASTM E1680 provide the loads and conditions under which the air barrier materials and air barrier accessories must be evaluated when combined as a roof assembly.

The calculated air leakage rate through the test specimen per ASTM D8052 or ASTM E1680 shall not be greater than 0.20 L/s-m² at a pressure differential of 75 Pa [0.04 cfm/ft² at a pressure differential of 1.57 psf when tested in both directions. The result shall be recorded to a minimum of three decimal places at a pressure differential of 75 Pa [0.0002 cfm/ft² at a pressure differential of 1.57 psf].

9 Reporting

The supplier requesting evaluation shall compile and submit, to ABAA, all documentation and reports required, as listed in Annex A. Once received, ABAA will review the completed documentation package to ensure all information is received and communicate with the supplier for clarification or missing items.

The date on any report or document shall not be more than five years old when submitted for evaluation.

9.1 Materials

The supplier shall submit a complete set of test reports including the information as required by the ABAA Material Specification for the specific type of material. The test report for each material property shall state that the laboratory followed the test method with no modifications—other than modifications—included in the ABAA Material Specification. If the test report does not contain complete information, the ABAA office will reject the report.

9.2 Assemblies

The supplier shall submit a complete test report including the information as required by ASTM E2357, ASTM D8052 or ASTM E1680. The report shall specify the conditions utilized within ASTM E2357, ASTM D8052 or ASTM E1680 that, and if loads under which the wall assembly were tested differ from ASTM E2357 (include the loads from **Table 1**), ASTM D8052 or ASTM E1680. The test report is to include results of the specimen without the brick-ties installed and then a second set of results after the brick-ties installed.

10 Review of Documentation

The technical completeness and consistency review will consist of the following:

- A Review of test reports
- B Review of specifications, installation instructions and product limitations

Where needed, the ABAA office will forward an itemized checklist with comments to the supplier outlining requests for further information, clarification or documentation.

Upon completion of the technical document review, the ABAA office will advise the supplier of approval or disapproval.

The assembly is listed on the ABAA website only after the final review has confirmed that all information required, including the test report for assembly testing is received, reviewed, and approved. Upon final approval, work shall commence on inserting the material in the appropriate master project specification.

11 Renewal

ABAA can randomly choose material sold in the marketplace and have the material tested to confirm that selected material properties (when tested) are comparable to the test report submitted for evaluation. The specific tests chosen will depend on the material category/type.

The results of any material property, if tested, shall be within 5 percent of the initial values submitted at the time of evaluation. The ABAA office shall remove the listing if the material has changed

more than 5 percent, or the supplier has not confirmed the listed material properties have not changed.

The license renewal occurs on an annual basis on December 31.

Every five years, the supplier shall declare/confirm that the air barrier materials, components or assemblies have not changed from the original submission or shall submit new test results for their material.

The ABAA office shall remove the listing if the supplier has not confirmed the material properties, components, materials and assemblies have not changed or supplied a new set of test reports.

12 Supplier's Obligations

The supplier shall consult with ABAA to determine the appropriate air, water-resistive or air and water-resistive barrier type for a material. If the material type does not fit into the existing ABAA Material Specifications, ABAA may decide to develop a new material specification for the type of material proposed.

When a supplier has provided the documentation required to have a material, accessory or assembly listed with ABAA, the supplier must sign a Licensing Agreement that would formalize the requirements to maintain a listing by ABAA. The licensed supplier may promote themselves as a "licensed supplier" and having an ABAA Evaluated material.

The Licensing Agreement includes ongoing maintenance requirements such as:

- A Maintaining professionalism;
- B Prompt submission of test results and documentation when product changes occur;
- C Internal audit every five years that would review supplier's documentation, and;
- D Compliance with the License Agreement.

13 Keywords

air barrier, water-resistive, membrane

**Annex A
(normative)**

**Documentation
Required
for Evaluating Assemblies to be Listed on the ABAA
Website**

The supplier shall submit the following documentation (signed) to the ABAA office for review.

Application Form

The supplier shall complete the application form for each material to be evaluated by ABAA.

ABAA Licensing Agreement

ABAA Licensing Agreement shall be completed and signed by the supplier (only once).

Non-Disclosure Agreement

ABAA Non-Disclosure Agreement shall be completed and signed by the supplier (only once).

Test Reports

The supplier shall provide a complete copy of each test report required by the ABAA material specification or material requirement table for the specific category and type of material along with the test report for the air barrier assembly.

Supporting Documentation

The supplier shall submit the following documentation for each air barrier material:

- A Technical data sheet for the material
- B Supplier guide/master specification for the material

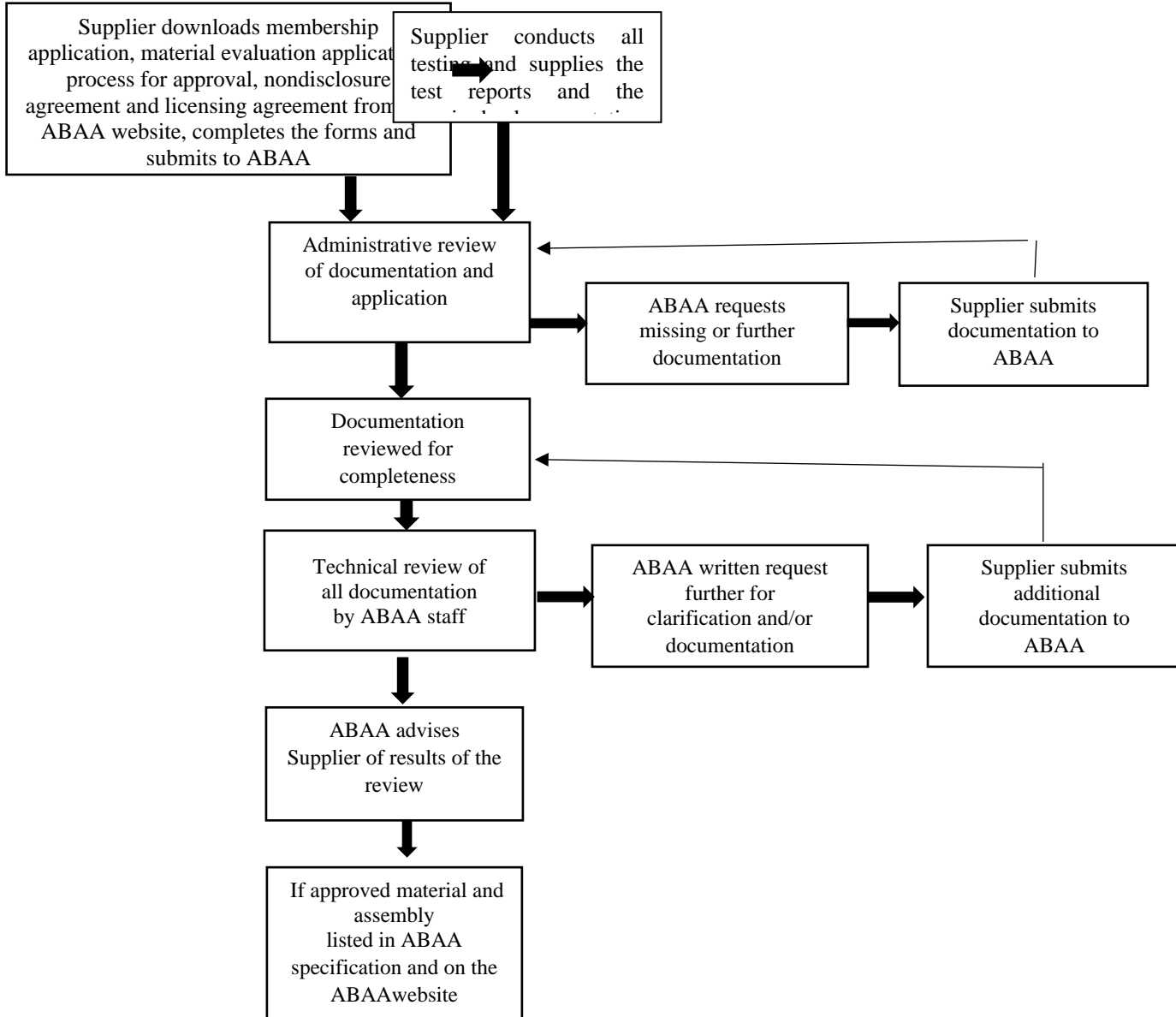
- C SDS for materials as delivered to project site and for the finished material if manufactured on site.
- D For wall air barrier materials, typical wall construction details (indicate if climate-specific) that include the following as a minimum.
 - 1. roof/wall
 - 2. wall/foundation
 - 3. window/wall
 - 4. expansion joint
 - 5. change in plane
 - 6. change in substrate
 - 7. penetrations
 - 8. inter-story connections
 - 9. deflection joints
 - 10. substrate joints
 - 11. Installation instructions that include information on:
 - a. substrate preparation
 - b. required ambient and substrate conditions (e.g., temperature, moisture content, wind, humidity, precipitation, falling temperature, etc.)
 - c. application method (e.g., mechanically fastened, trowel on, roll on, or spray on)
 - d. sequence and technique for installation of air barrier materials and air barrier accessories
 - e. material compatibility listing
 - f. air barrier accessories
 - g. for fluid-applied membranes: minimum installation thickness based on the thickness of the air barrier material only, used for the testing without any substrate. Indicate when the air barrier material is installed directly on the framing without any substrate
 - h. list of substrates that the material can be installed on and specifically list any substrate where the supplier does not recommend installation
 - i. Service temperature of installed material
 - j. Declared VOC content in g/l and test method or declared emission compliance or certification
 - k. Maximum allowed UV exposure
 - l. Shelf life of material
 - m. Storage requirements

- E For roof air barrier materials, typical roof construction details (indicate if climate-specific) that include the following as a minimum.
1. roof/wall
 2. expansion joint
 3. change in the plane
 4. change in substrate
 5. penetrations
 6. deflection joints
 7. substrate joints
 8. Installation instructions that include information on.
 - a. substrate preparation
 - b. required ambient and substrate conditions (e.g., temperature, moisture content, wind, humidity, precipitation, falling temperature, etc.)
 - c. application method (e.g., mechanically fastened, trowel on, roll on, or spray on)
 - d. sequence and technique for installation of air barrier materials and air barrier accessories
 - e. material compatibility listing
 - f. listing of air barrier accessories
 - g. for fluid-applied membranes - minimum installation thickness based on the thickness of the material used for testing
 - h. list of substrates that the material can be installed on and specifically list any substrate where the supplier does not recommend installation
 - i. Service temperature of installed material
 - j. Declared VOC content in g/l and test method or declared emission compliance or certification
 - k. Maximum allowed UV exposure
 - l. Shelf life of material
- F Supplier's logo [Provide logo electronically in vector format (.eps or .ai)]
- G Submission of representative product samples
1. The supplier shall submit three material samples,
 - a. Each sample shall be a minimum size of 120 square inches.

Annex B
 (normative)

Flow Chart

ABAA Process for Evaluation of Air Barrier Materials,
 Accessories, Components, and Assemblies



Annex C (normative)

Air Barrier Wall Assembly Specimens

The base wall requires standardization for testing, so the only variation between tests conducted by different suppliers is the air barrier materials and accessories used to create an air barrier wall assembly. The base wall has gaps incorporated into the specimen to mirror typical construction on a project site.

The key on the following page lists the numbered components for all specimen drawings, where referenced in the text the material numbers will be show in brackets.

Key to Specimen Drawings

1. 37 mm x 235 mm (2-inch x 10-inch) wood buck on all four sides with the corners sealed airtight
2. CMU medium density 400 mm x 200 mm x 150 mm (16-inch x 8-inch x 6-inch)
3. Wood mud sill 37 mm x 140 mm (2-inch by 6-inch)
4. Rim joist 37 mm x 140 mm (2-inch by 6-inch)
5. Floor joist 37 mm x 140 mm (2-inch by 6-inch)
6. Plywood sub-floor 16 mm (5/8-inch)
7. Wood plate 37 mm x 89 mm (2-inch x 4-inch)
8. Wood stud 37 mm x 100 mm (2-inch by 4-inch)
9. OSB sheathing 11 mm (7/16-inch) or the structural air barrier material itself
10. Sheet metal angle 26-gauge 100 mm x 100 mm (4-inch x 4-inch) – corners and joints sealed
11. Air and water-resistive barrier material – if in rolls, sheets, or boards, install with at least two horizontal joints and three vertical joints
12. Brick ties – corrugated surface mount or equivalent
13. Window blank – constructed with a 37 mm x 89 mm (2-inch x 4-inch) wood frame rabbited for a panel of 16 mm (5/8-inch) plywood installed into the wood frame. All joints sealed and covered with three coats of urethane
14. Electrical box – octagon surface mount
15. Electrical box – octagon recessed mount
16. Electrical box – square double gang surface mount
17. Electrical box – square double gang recessed mount
18. Pipe – PVC 38 mm (1½-inch) diameter
19. Duct – square galvanized 100 mm x 100 mm (4-inch x 4-inch)
20. Floor – poured concrete 100 mm (4-inch) thick
21. Steel track – galvanized 100 mm (4-inch)
22. Steel stud – galvanized 100 mm (4-inch)
23. Exterior sheathing – fiberglass mat faced gypsum-based 16 mm (5/8-inch) installed with 3 mm (1/8-inch) gaps on all joints or the structural air barrier material itself
24. Brick ties – corrugated sheet metal anchors minimum size of 22 gage x 7/8-inch-wide with corrugation wavelength between 0.3 to 0.5 inch, and an amplitude of 0.06 to 0.1 inch. They are to be installed with screws. The fastener must be located within ½ inch of the 90-degree bend in the anchor.
25. Steel channel – 250 mm (10-inch)
26. Brick tie – eye wire

Wood Stud Construction Wall Specimen without Penetrations and Terminations

Wood Buck

Construct a wood buck by assembling a 37 mm x 235 mm (2-inch x 10-inch) [1] wood frame to fit the specimen. The corners are to be sealed and fastened with wood screws to provide an airtight structure when placed up against the airflow apparatus. A 16-gauge sheet metal angle [10] covers the wood buck's front edge and extends 100 mm (4-inch) back on the inside of the wood buck on all four sides.

Foundation/Floor Assembly

The foundation/floor assembly includes:

- A One row of 150 mm (6-inch) deep CMU [2] placed on the wood buck with joints between the CMUs filled with mortar.
- B Wood mudsill (37 mm x 140 mm (2-inch x 6-inch) [3] with a 3 mm (1/8-inch) gauged gap between the mudsill and the CMU
- C Mock floor: comprised of a 37 mm x 140 mm (2-inch x 6-inch) rim joist [4] and 140 mm (6-inch) long, 37 mm x 140 mm (2-inch x 6-inch) joists [5] spaced every 400 mm (16-inch).
- D Subfloor 16 mm (5/8-inch) thick plywood sub-floor [6] was installed over the wood floor joists with 3 mm (1/8-inch) thick shims between the sub-floor and the wood joists halfway between the floor joists.

Wall Assembly

The wall assembly includes:

- A Wood-framed wall consisting of a 37 mm x 89 mm (2-inch x 4-inch) wood bottom plate (7), 37 mm x 89 mm (2-inch x 4-inch) wood studs [8] spaced 600 mm (24-inch) on center, and two 37 mm x 89 mm (2-inch x 4-inch) wood top plates [7] fasten with nails or screws.
- B Sheathing 11 mm (7/16-inch) thick OSB [9]

1. Secured in place with screws or nails in accordance with code requirements for the load selected for testing.
2. Horizontal joint at mid-height (halfway) in the wall
3. Vertical joint in each row of sheathing, offset two stud cavities from each other.
4. All vertical joints shall be on a wood stud.
5. Terminating at the bottom of the mudsill
6. 3 mm (1/8-inch) nominal gap at every joint between sheathing

- C Wall specimen installed in the wood buck with a 3 mm (1/8-inch) nominal gap between the framing members and the wood buck.

C.1.1 Air and/or Water-resistive Barrier Installation

A qualified installer shall install the air barrier materials and accessories [11] following the supplier's installation instructions, including joints for sheet or board material. Any additions, deletions, or deviations to the installation instructions shall be documented and provided in the test report. The installation shall detail the connection between the wood wall and the CMU foundation and the wall and the wood buck, including the metal cladding on the wood buck.

C.1.2 Brick Tie Installation

the brick ties are to be installed after the air/water-resistive barrier material has been installed and allowed to cure, install surface mount brick ties thirty [30] equally spaced into the wood studs. Surface mount brick ties shall be installed following the brick tie supplier's instructions and detailed following the air barrier supplier's instructions.

Specimen C.1 Wood Stud Construction

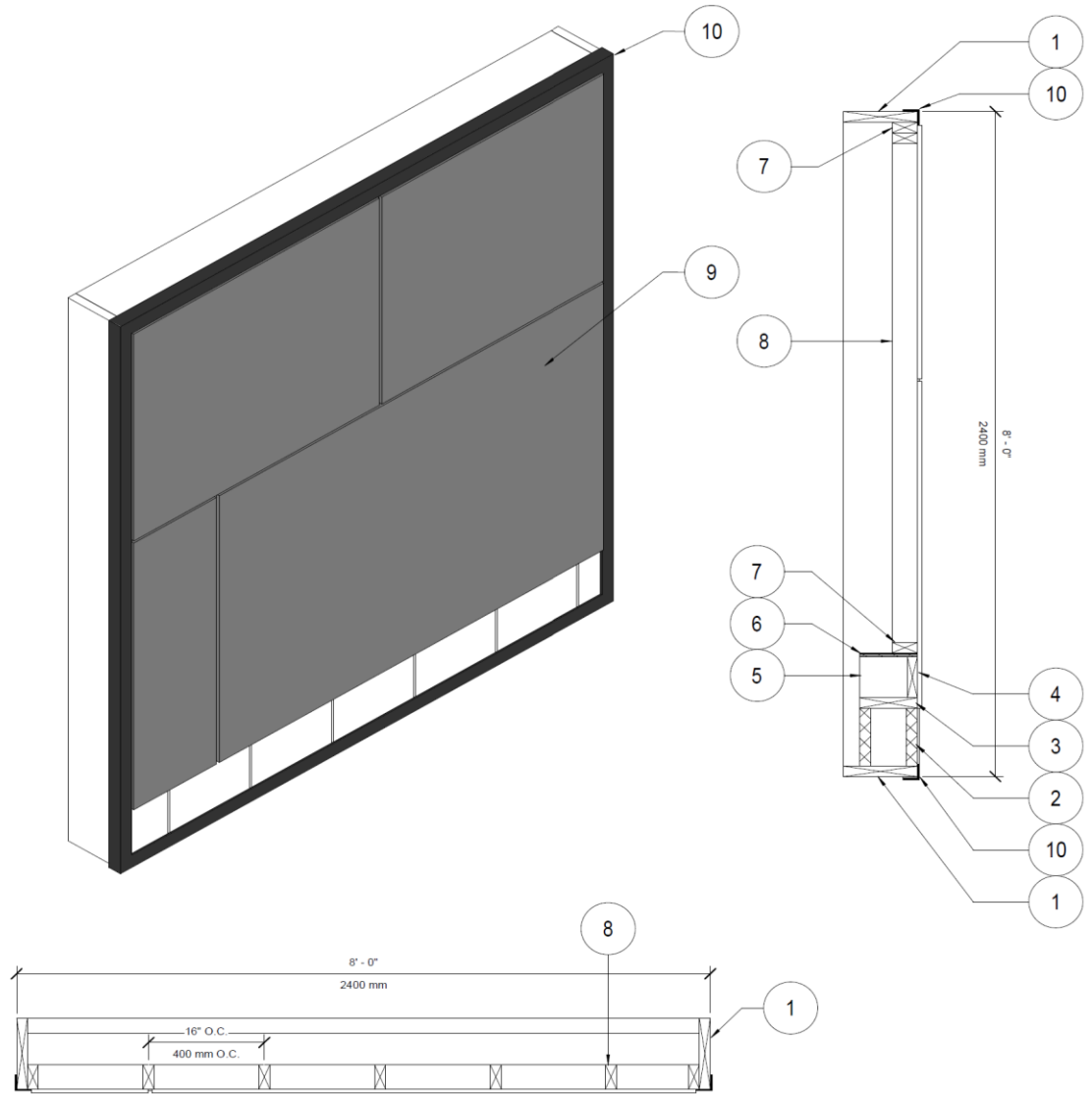


Figure 1
Base Wall: Wood Stud Specimen – Exterior View

Specimen C.1 Wood Stud Construction

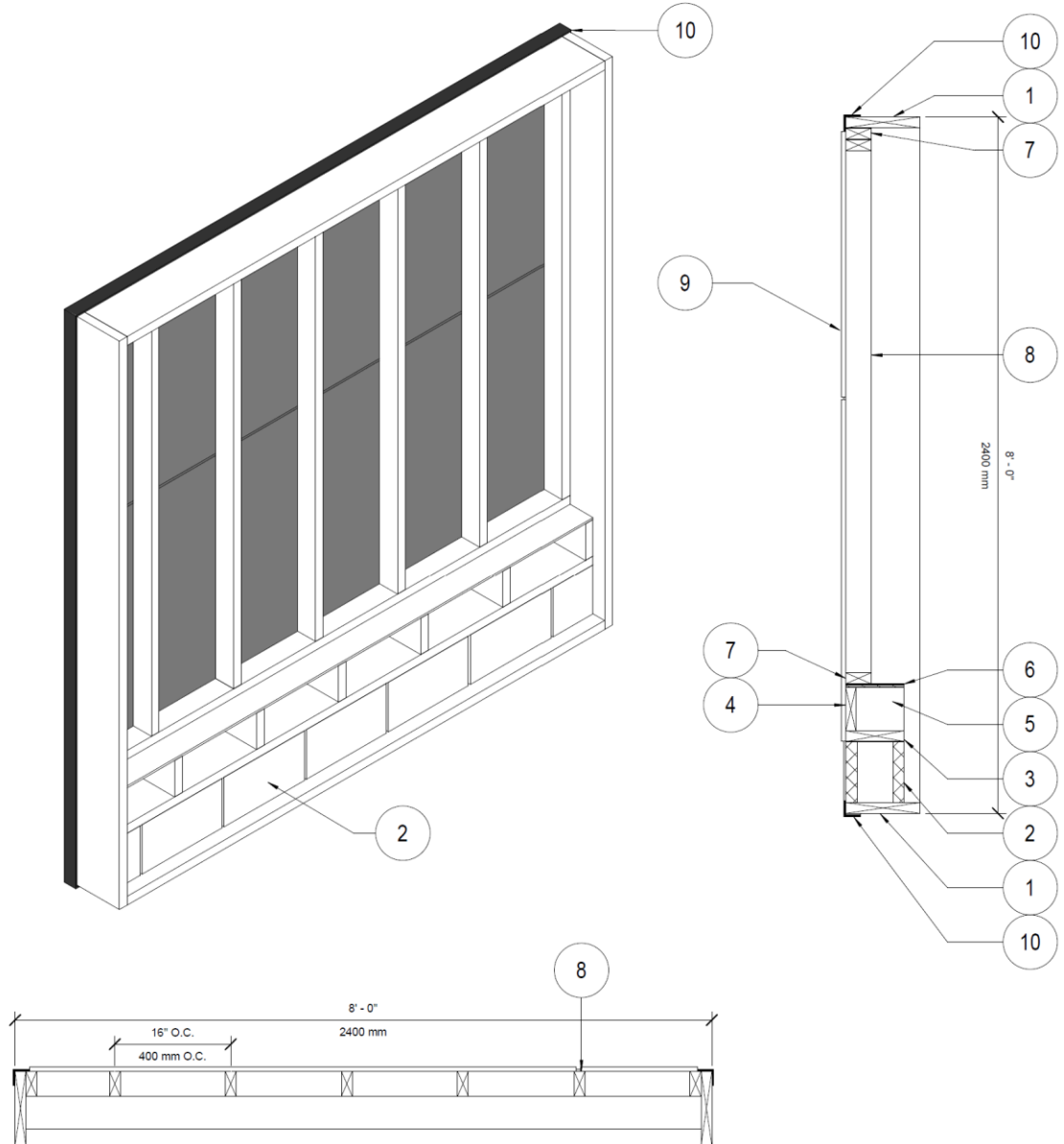


Figure 2
Base Wall: Wood Stud Specimen – Interior View

Specimen C.1 Wood Stud Construction

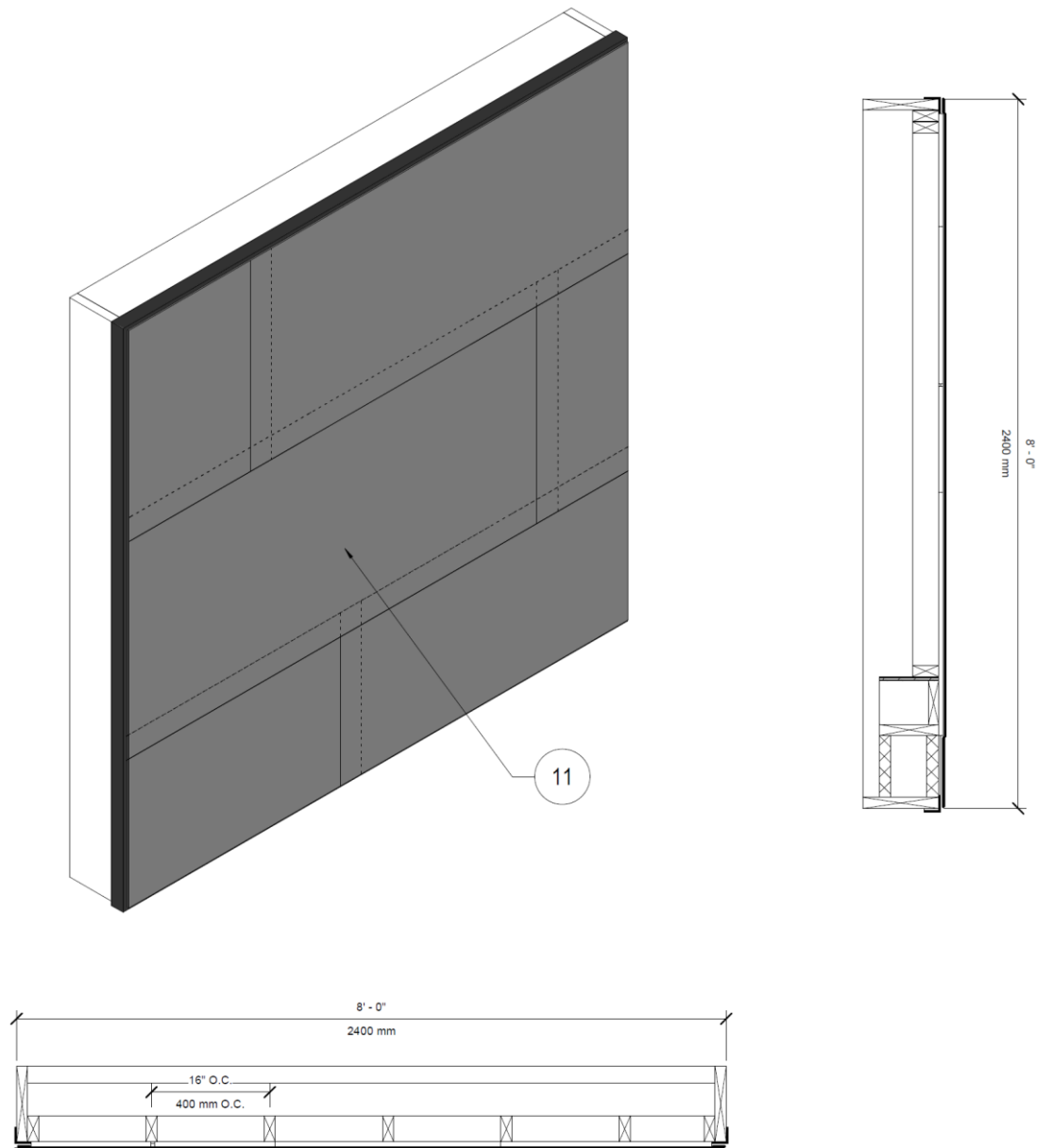


Figure 3
Base wall: Wood Stud Specimen – Air and/or Water-
resistive Barrier Installed

Specimen C.1 Wood Stud Construction

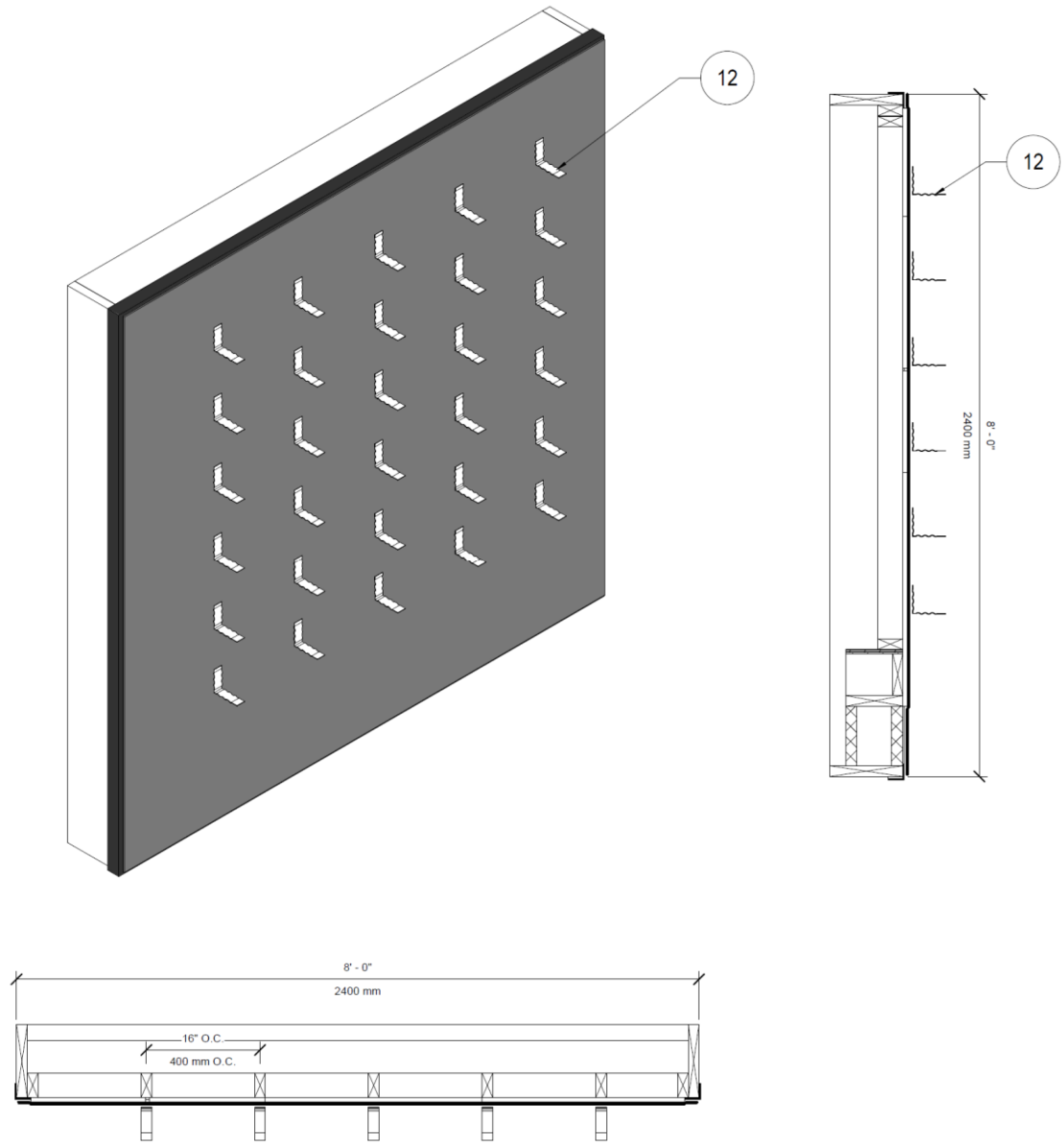


Figure 4
Base Wall: Wood Stud Specimen – Brick Ties Installed

C.2 Wood Stud Construction Wall Specimen with Penetrations and Terminations

Construct a second specimen following the exact requirements as specified in Annex Section C.1 except brick ties are not required and the wall specimen shall include the following:

- A A window rough opening constructed in the wall measuring 800 mm by 800 mm including:
 - 1. A single 50 mm x 100 mm (2-inch x 4-inch) wood plate installed at the top and bottom of the rough opening between two stud openings.
 - 2. A blank window constructed with outside dimensions of 750 mm by 750 mm (30-inch x 30-inch) nominal, leaving a 12 mm (1/2-inch) space between the rough opening and the blank window.
 - a. The blank window includes a bare, medium density plywood window blank sealed and secured into a rabbeted wood buck.
- B Surface-mounted [14,16] and recessed [15,17] junction boxes.
 - 1. The boxes may be proprietary and form part of the continuity of the proprietary air barrier assembly or conventional boxes that are air sealed with air barrier materials and/or accessories.
 - 2. The published test report shall state the methodology used to seal junction boxes.
- C A PVC pipe [18] with a 38 mm (1½-inch) nominal outside diameter
 - 1. The hole made in the substrate to install the pipe shall be 60 mm (2 ¼-inch) diameter to allowing an approximately 12 mm (1/2 inch) gap between the pipe and the rough opening hole in the sheathing around the pipe.
- D A galvanized steel duct [19] measuring 100 mm by 100 mm (4-inch x 4-inch)

1. The hole made in the substrate to install the duct shall be 125 mm by 125 mm (5-inch x 5-inch) nominal to allowing an approximately 12 mm (1/2 inch) gap between the duct and the rough opening hole in the sheathing around the duct.

Specimen C.2 Wood Stud Construction with Penetrations and Terminations

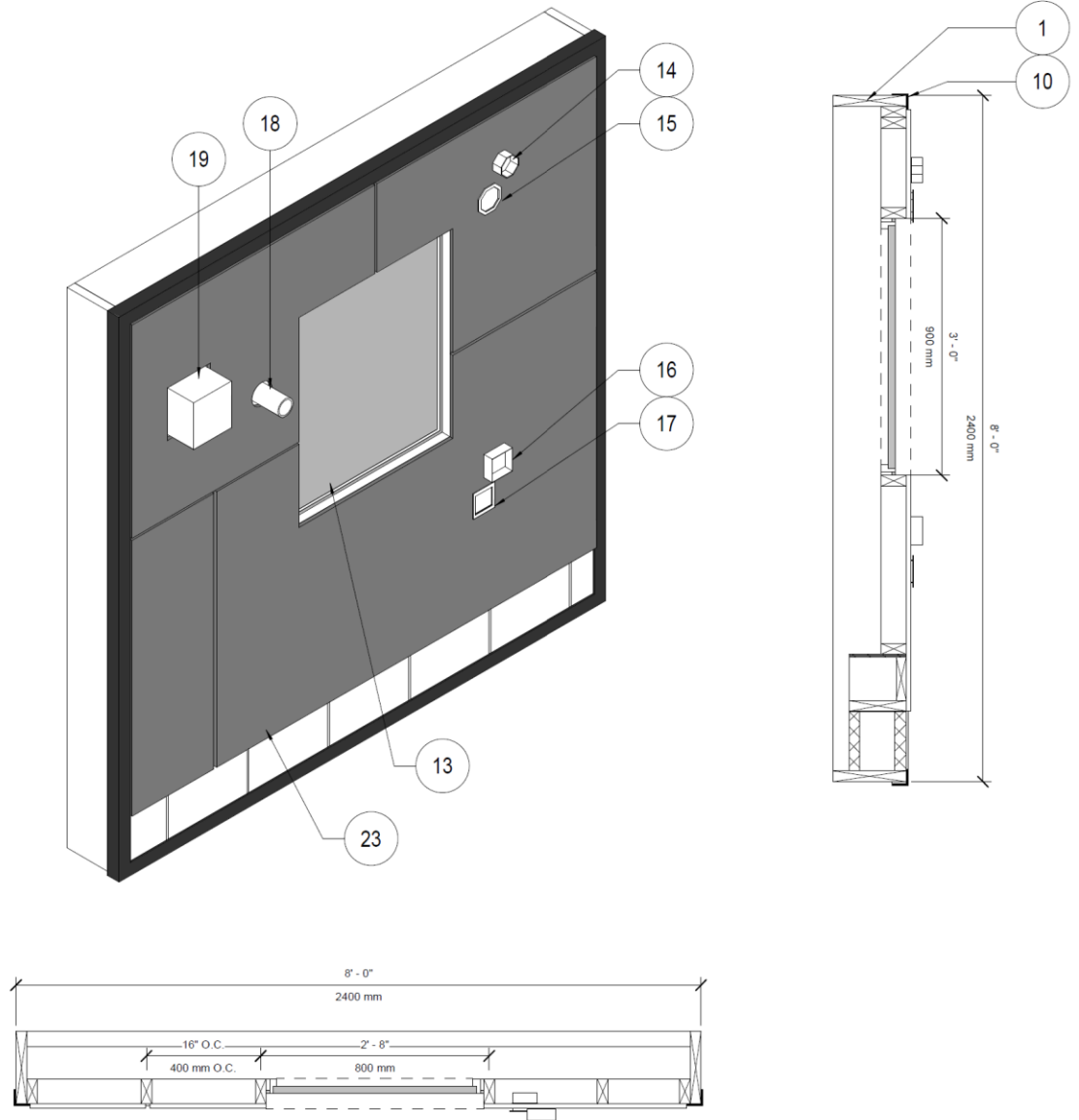


Figure 5
Base Wall: Wood Stud Specimen – Exterior View with Penetrations

**Specimen C.2 Wood Stud Construction with Penetrations
and Terminations**

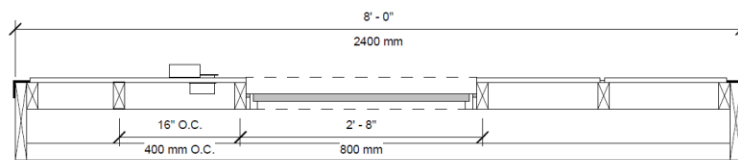
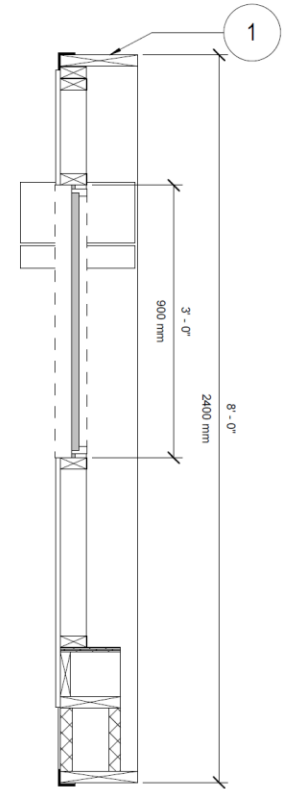
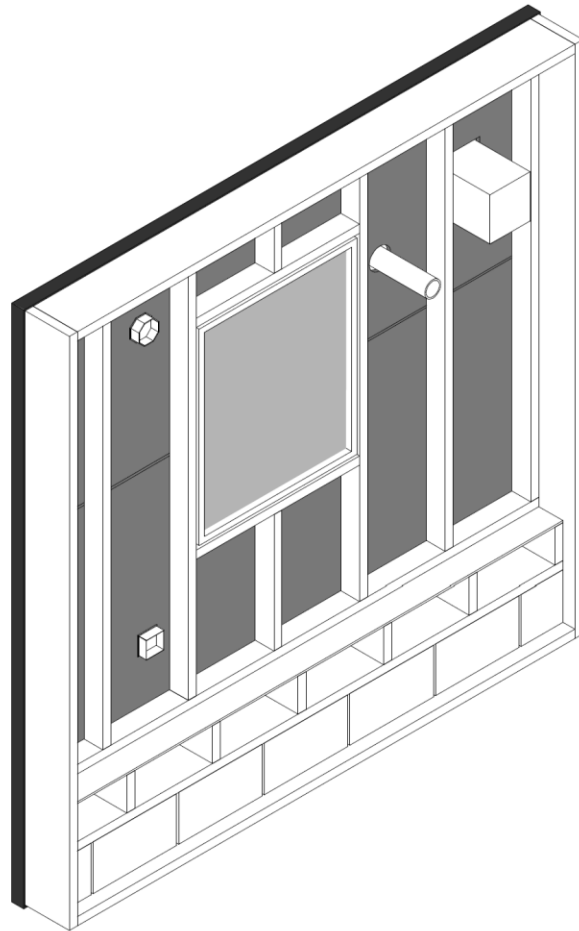


Figure 6
Base Wall: Wood Stud Specimen – Interior View with Penetrations

C.3 Steel Stud Construction Wall Specimen without Penetrations and Terminations

C.3.1 Wood Buck

A wood buck [1] is constructed by assembling a 50 mm x 250 mm (2-inch x 10-inch) wood frame into which the specimen wall will be built. The corners are to be sealed and fastened with wood screws to provide an airtight frame when placed up against the airflow apparatus. A 26-gauge sheet angle [10] shall be installed which covers the edge of the wood buck and extends 100 mm (4 -inch) back on the wood buck on the top and both sides of the wood buck.

C.3.2 Foundation/Floor Assembly

The base wall has a 200 mm x 200 mm (8-inch x 8-inch) poured concrete floor [20] installed in the wood buck.

C.3.3 Wall Assembly

Construct a steel stud framed wall consisting of a 90 mm (3½-inch) wide steel track, top and bottom [21], 90 mm (3½-inch) steel studs [22] spaced 400 mm (16-inch) on center. The framing members shall be secured with fasteners. The framing is then sheathed with a 16 mm (5/8-inch) thick fiberglass mat faced gypsum-based board [23] and fastened in place with drywall screws. The sheathing shall have a horizontal joint at mid-height in the wall, and there shall be a vertical joint in each row of sheathing, offset from each other, and vertical joints shall be on a stud. There shall be a 3 mm (1/8 inch) nominal gap at every joint in the gypsum sheathing, including between the gypsum sheathing and the wood buck. The wall is to be installed in the wood buck with a 3 mm (1/8-inch) nominal gap between the framing members and the wood buck.

C.3.4 Air and/or Water-resistive Barrier Installation

A qualified installer shall install the air barrier materials and accessories [11] following the supplier's installation instructions, including joints for sheet or board material. Any additions, deletions, or deviations to the installation instructions shall be

documented and provided in the test report. The installation shall detail the connection between the steel stud wall and the poured concrete foundation and the steel stud wall and the wood buck, including the metal cladding on the wood buck.

C.3.5 Brick Tie Installation

Install surface mount brick ties [30] equally spaced into the steel studs. Surface mount brick ties shall be installed following the brick tie supplier's instructions and detailed following the air barrier supplier's instructions.

Specimen C.3 Steel Stud Construction

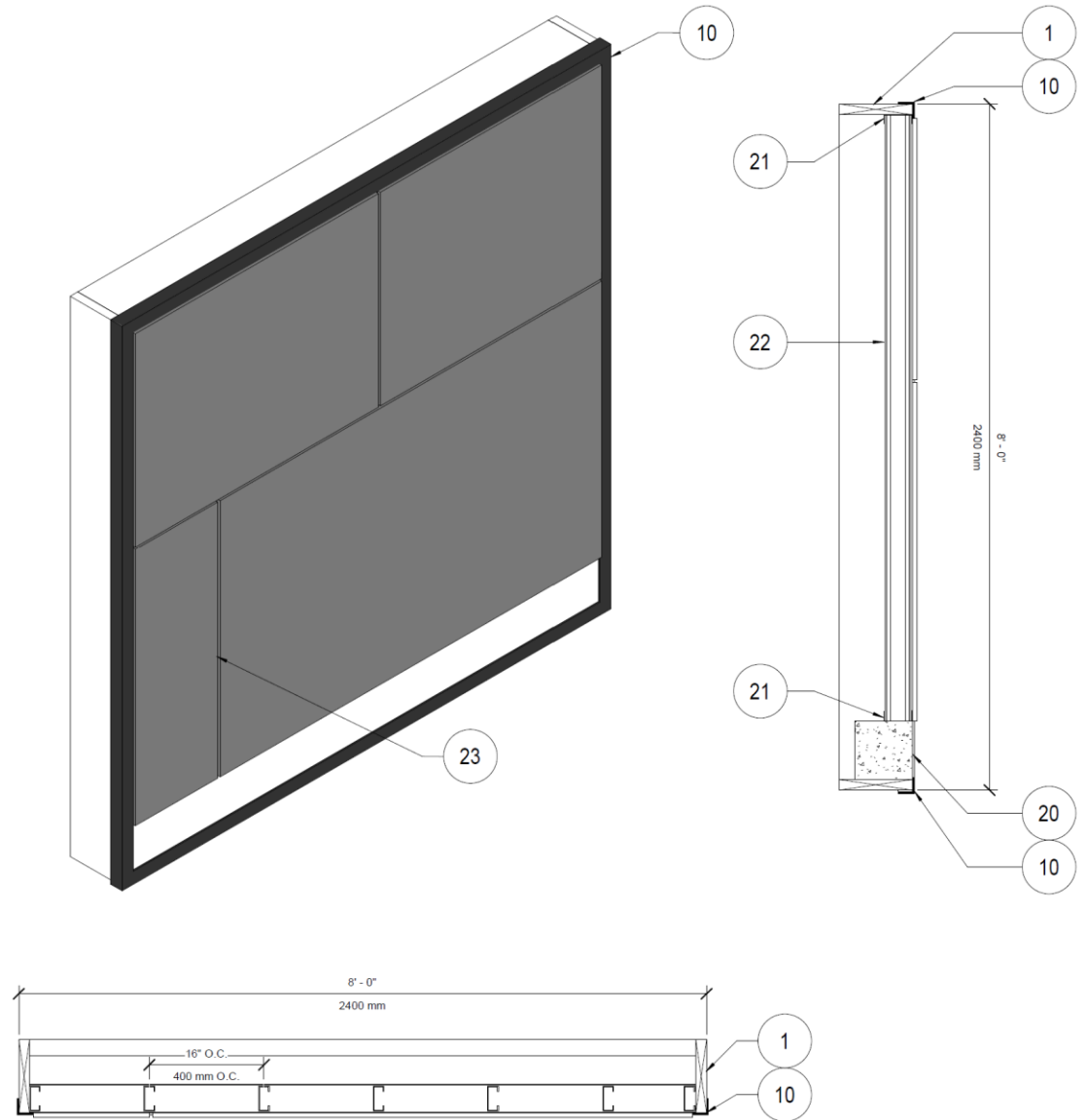


Figure 7
Base Wall: Steel Stud Specimen – Exterior View

Specimen C.3 Steel Stud Construction

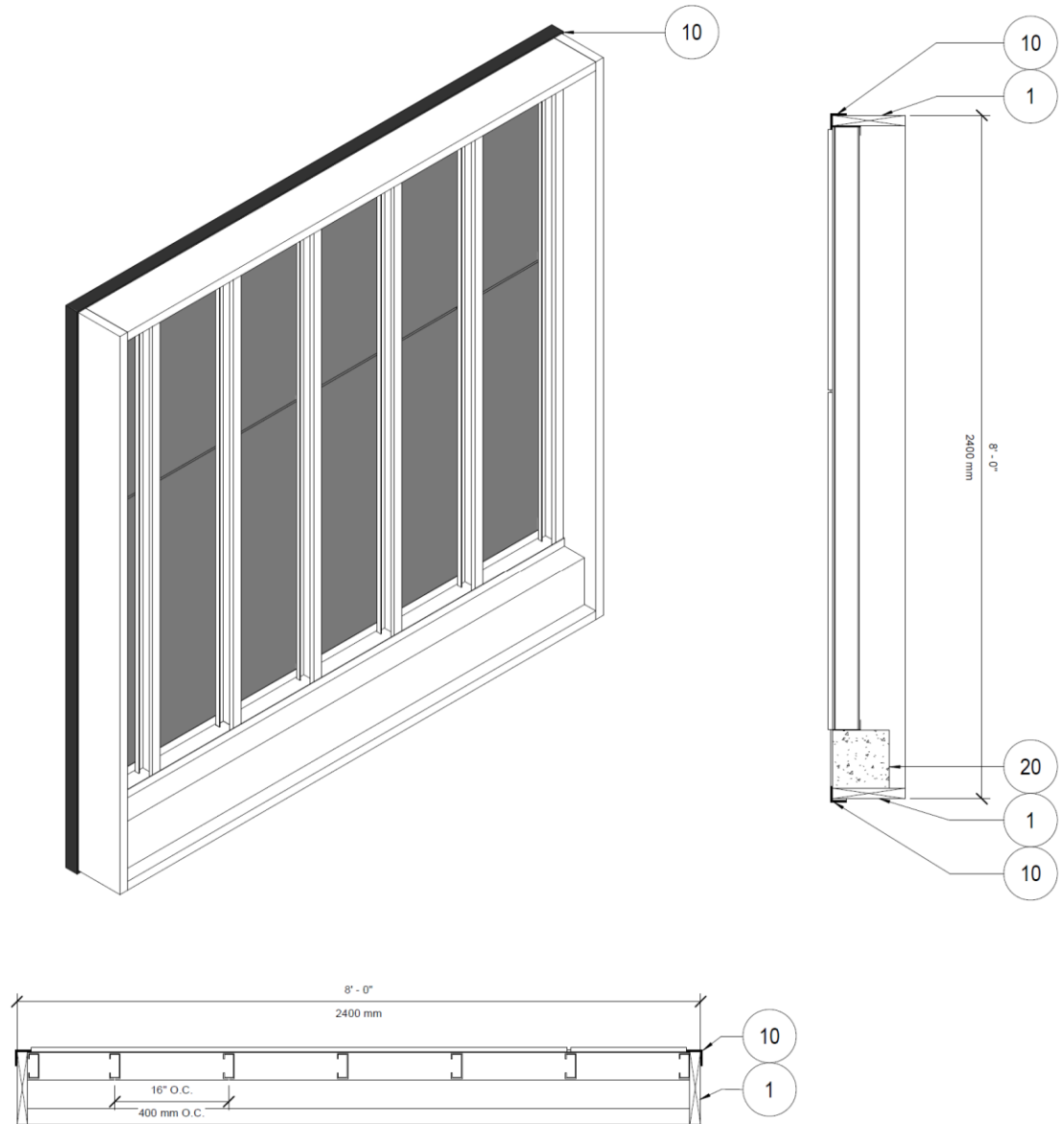


Figure 8
Base Wall: Steel Stud Specimen – Interior View

Specimen C.3 Steel Stud Construction

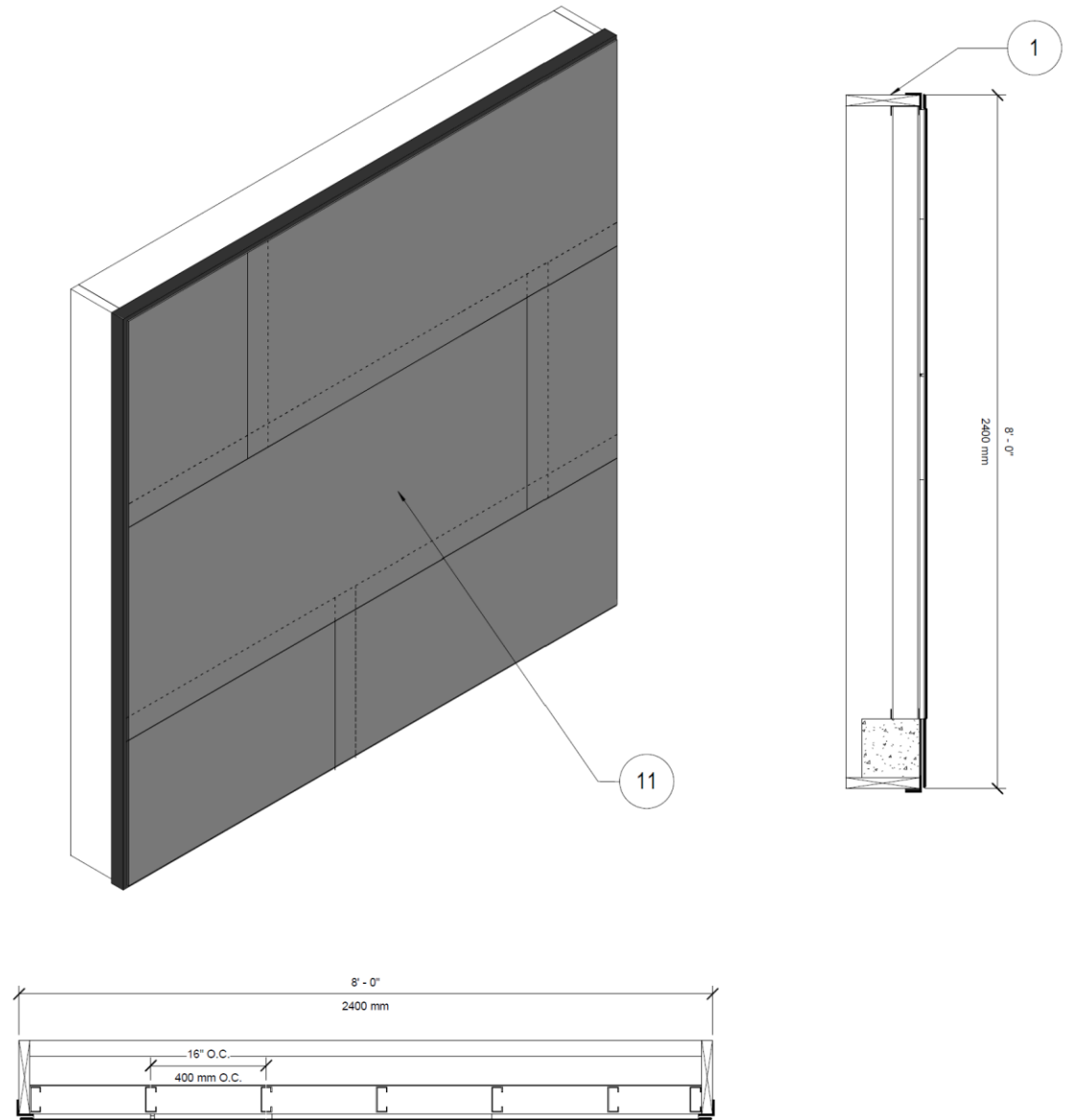


Figure 9
Base Wall: Steel Stud Specimen – Air and/or Water-resistant Barrier Installed

Specimen C.3 Steel Stud Construction

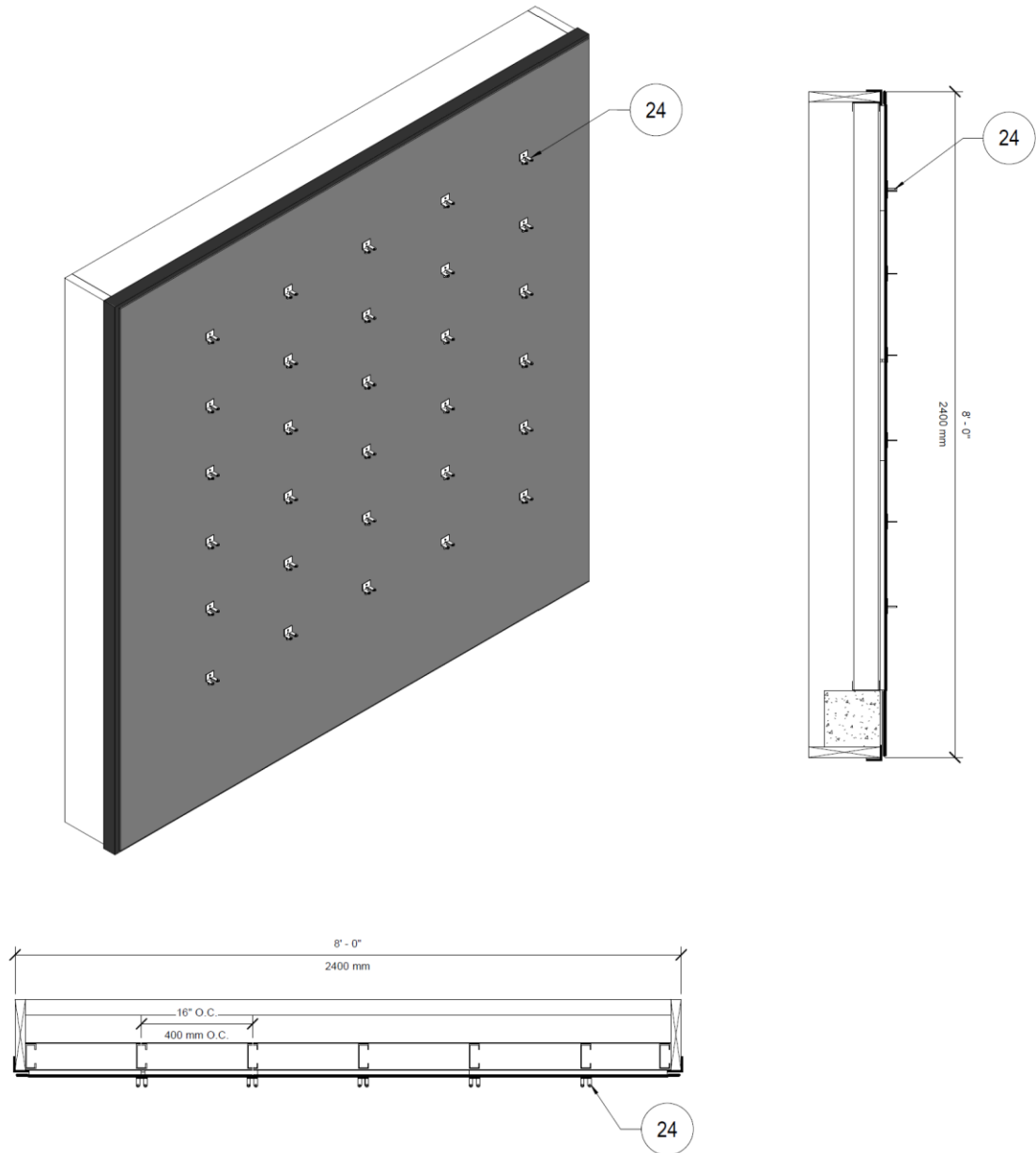


Figure 10
Base Wall: Steel Stud Specimen – Surface Brick Ties
Installed

C.4 Steel Stud Frame Construction Wall Specimen with Penetrations and Terminations

Construct a second specimen following the exact requirements as specified in Annex Section C.4 except brick ties are not required and the wall specimen shall include the following:

- A A window rough opening constructed in the wall measuring 800 mm by 800 mm including:
 - 1. A single 50 mm x 100 mm (2-inch x 4-inch) wood plate installed at the top and bottom of the rough opening between two stud openings.
 - 2. A window blank [13] constructed with outside dimensions of 750 mm by 750 mm (30-inch x 30-inch) nominal, leaving a 12 mm (1/2-inch) space between the rough opening and the blank window.
 - a. The blank window includes a bare, medium density plywood window blank sealed and secured into a rabbeted wood buck.
- B Surface-mounted [14,16] and recessed [15,17] junction boxes.
 - 1. The boxes may be proprietary and form part of the continuity of the proprietary air barrier assembly or conventional boxes that are air sealed with air barrier materials and/or accessories.
 - 2. The published test report shall state the methodology used to seal junction boxes.
- C A PVC pipe [18] with a 38 mm (1 ½-inch) nominal outside diameter.
 - 1. The hole made in the substrate to install the pipe shall be 60 mm (2 ¼-inch) diameter to allowing an approximately 12 mm (1/2 inch) gap between the pipe and the rough opening hole in the sheathing around the pipe.
- D A galvanized steel duct [19] measuring 100 mm by 100 mm (4-inch x 4-inch)

1. The hole made in the substrate to install the duct shall be 125 mm by 125 mm (5-inch x 5-inch) nominal to allowing an approximately 12 mm (1/2 inch) gap between the duct and the rough opening hole in the sheathing around the duct.

Specimen C.4 Steel Stud Construction with Penetrations and Terminations

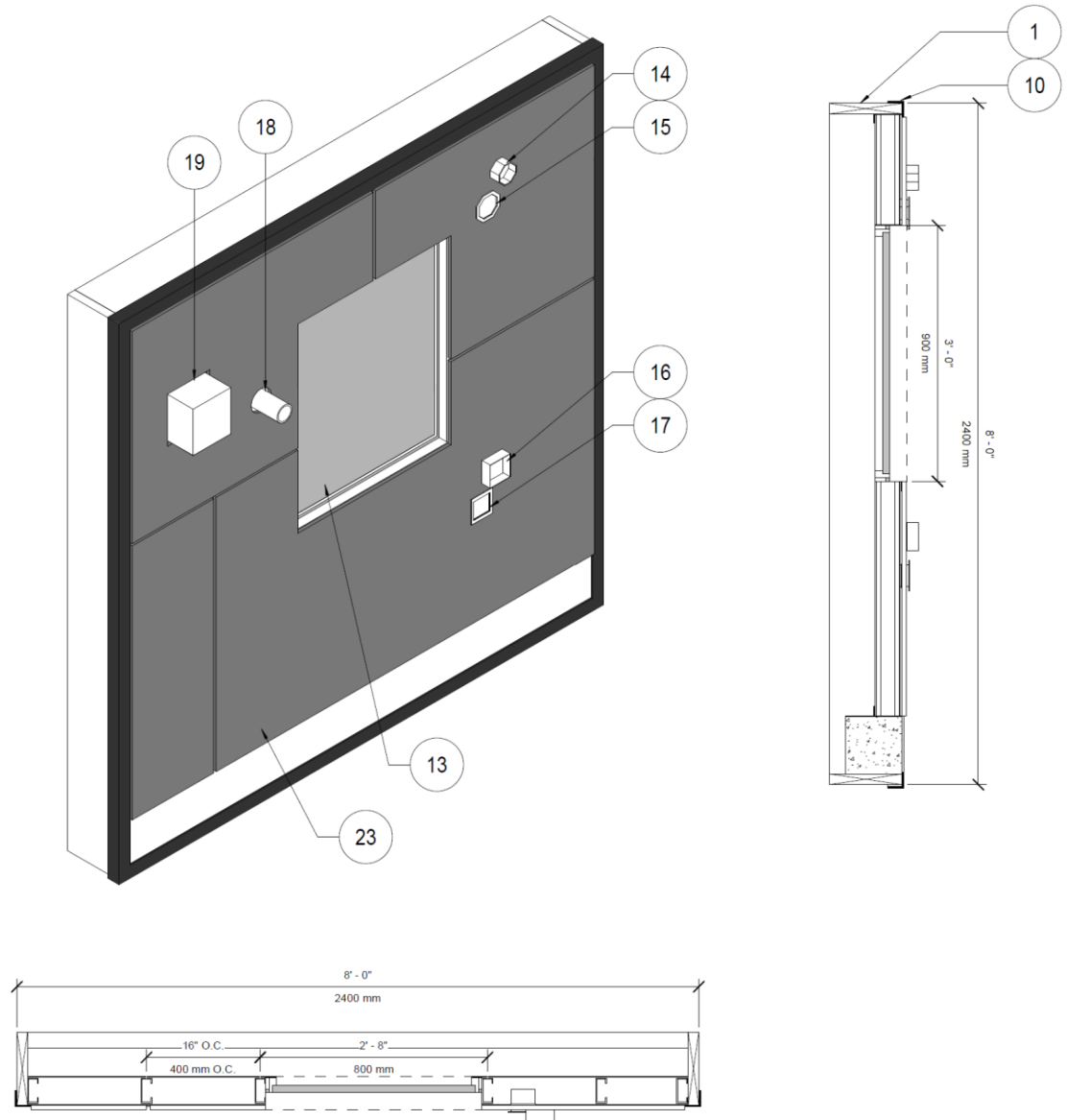


Figure 11
Base Wall: Steel Stud Specimen – Exterior View with Penetrations

**Specimen C.4 Steel Stud Construction with Penetrations
and Terminations**

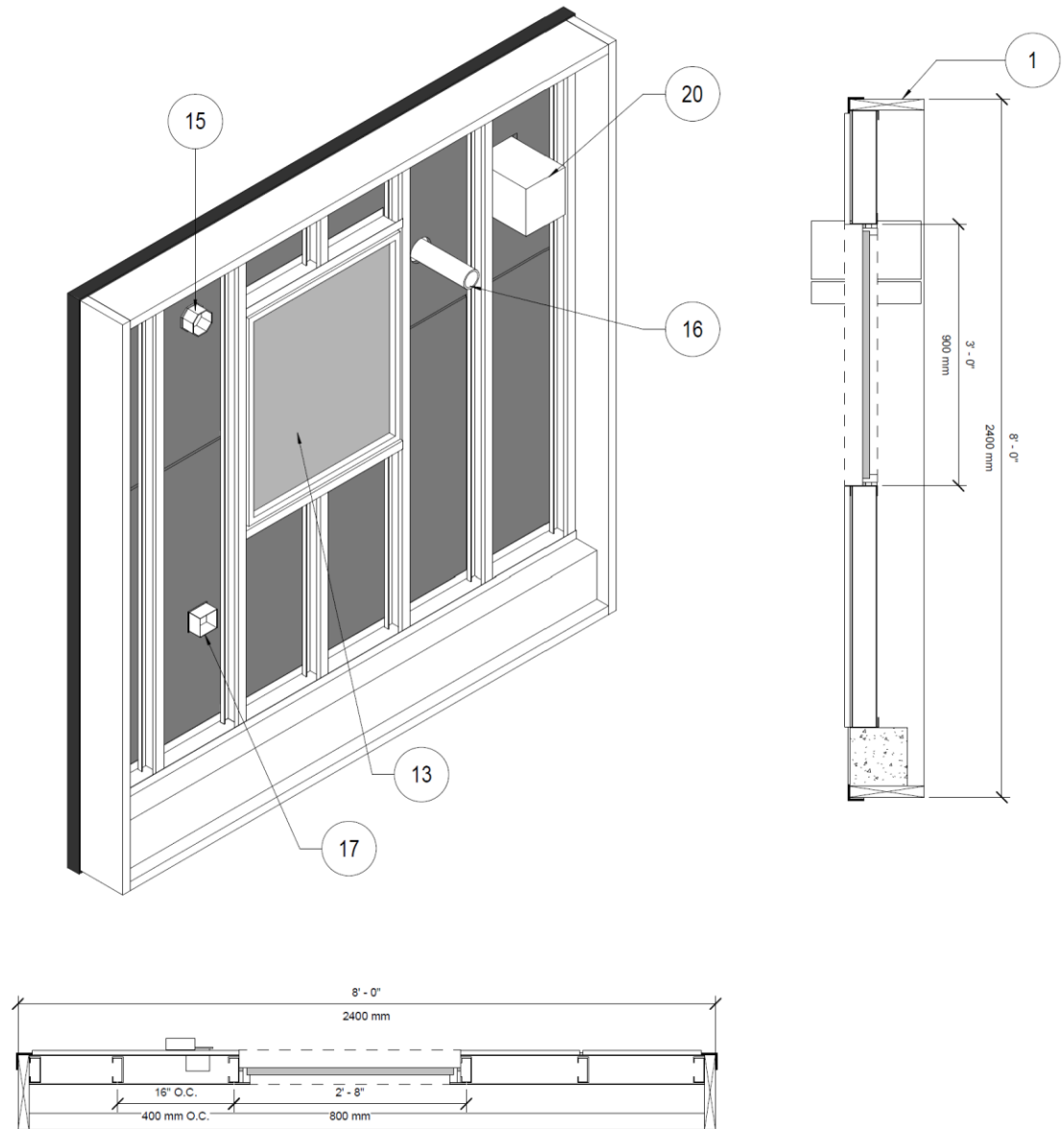


Figure 12
Base Wall: Steel Stud Specimen – Interior View with Penetrations

C.5 CMU Construction Wall Specimen without Penetrations and Terminations

C.5.1 Steel Channel Buck

A steel channel buck is constructed by assembling a steel U channel frame [25] that the specimen wall will be built into it. The corners are to be welded to provide an airtight frame when placed up against the airflow apparatus.

C.5.2 Foundation / Floor Assembly

The base wall has a 200 mm (8 -inch) deep by 200 mm (8-inch) high poured concrete floor [20] installed on the steel channel buck.

C.5.3 Wall Assembly

Construct a CMU wall using medium-density 400 mm x 200 mm x 200 mm (16-inch by 8-inch by 8-inch) blocks. There shall be a 3 mm (1/8 inch) nominal gap between the CMU blocks and the steel buck. If utilizing set in wall eye wire brick ties [26], install equally spaced in the CMU wall, and detail during air and/or water resistive barrier installation.

C.5.4 Air and/or Water-resistive Barrier Installation

A qualified installer shall install the air barrier materials and accessories [11] following the supplier's installation instructions, including joints for sheet or board material. Any additions, deletions, or deviations to the installation instructions shall be documented and provided in the test report. The installation shall detail the connection between the CMU wall and the poured concrete foundation and the CMU wall and the steel buck.

C.5.5 Brick Tie Installation

If using surface-mount brick ties [24] install them equally spaced in the CMU wall. The brick ties shall be installed following the brick tie supplier's instructions and detailed following the air barrier supplier's instructions.

Specimen C.5 CMU Construction

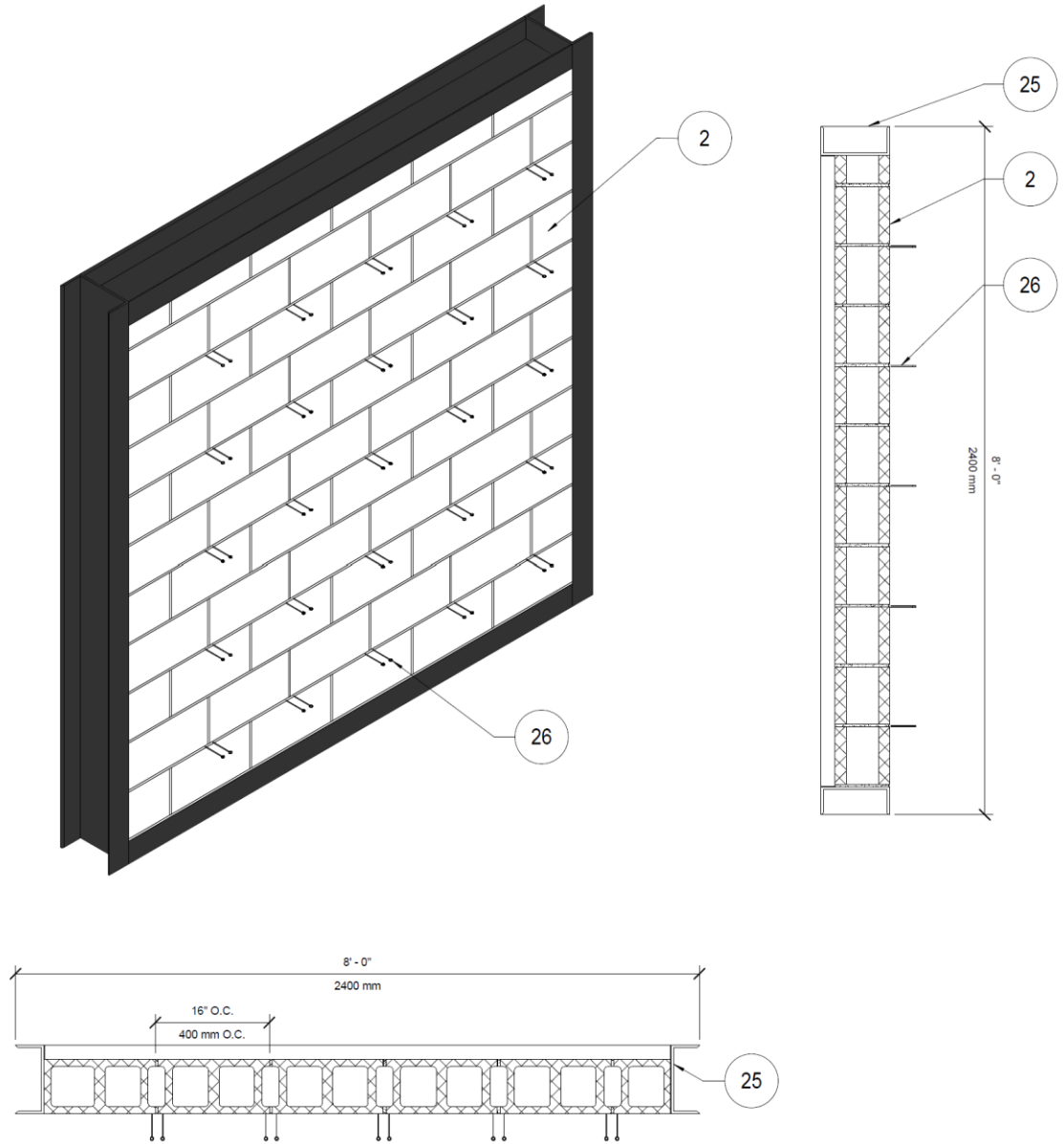


Figure 13
Base Wall: CMU Specimen – Exterior View with Eye Wire
Brick Ties Installed

Specimen C.5 CMU Construction

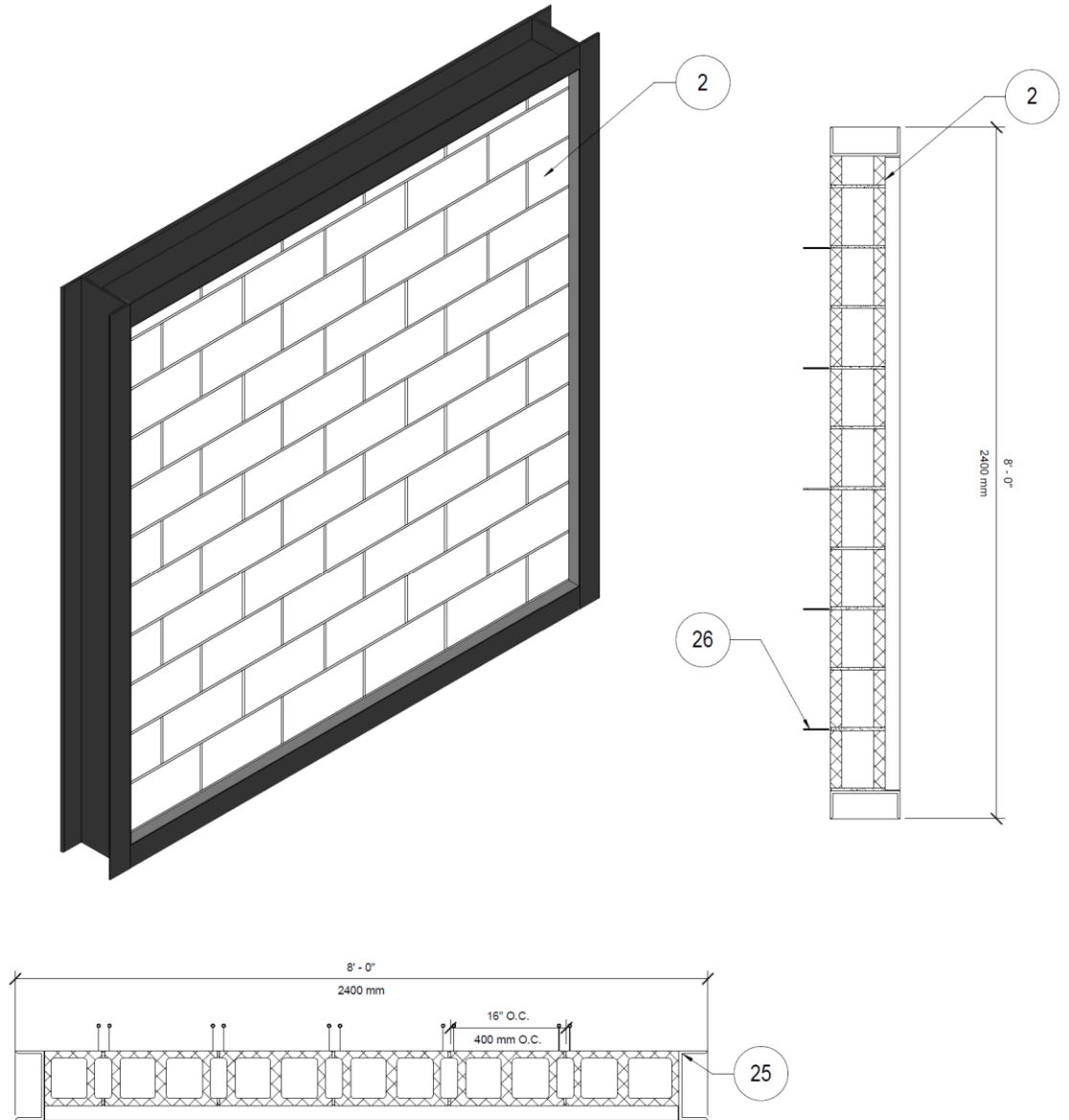


Figure 14
Base Wall: CMU Specimen – Interior View with Eye Wire
Brick Ties Installed

Specimen C.5 CMU Construction

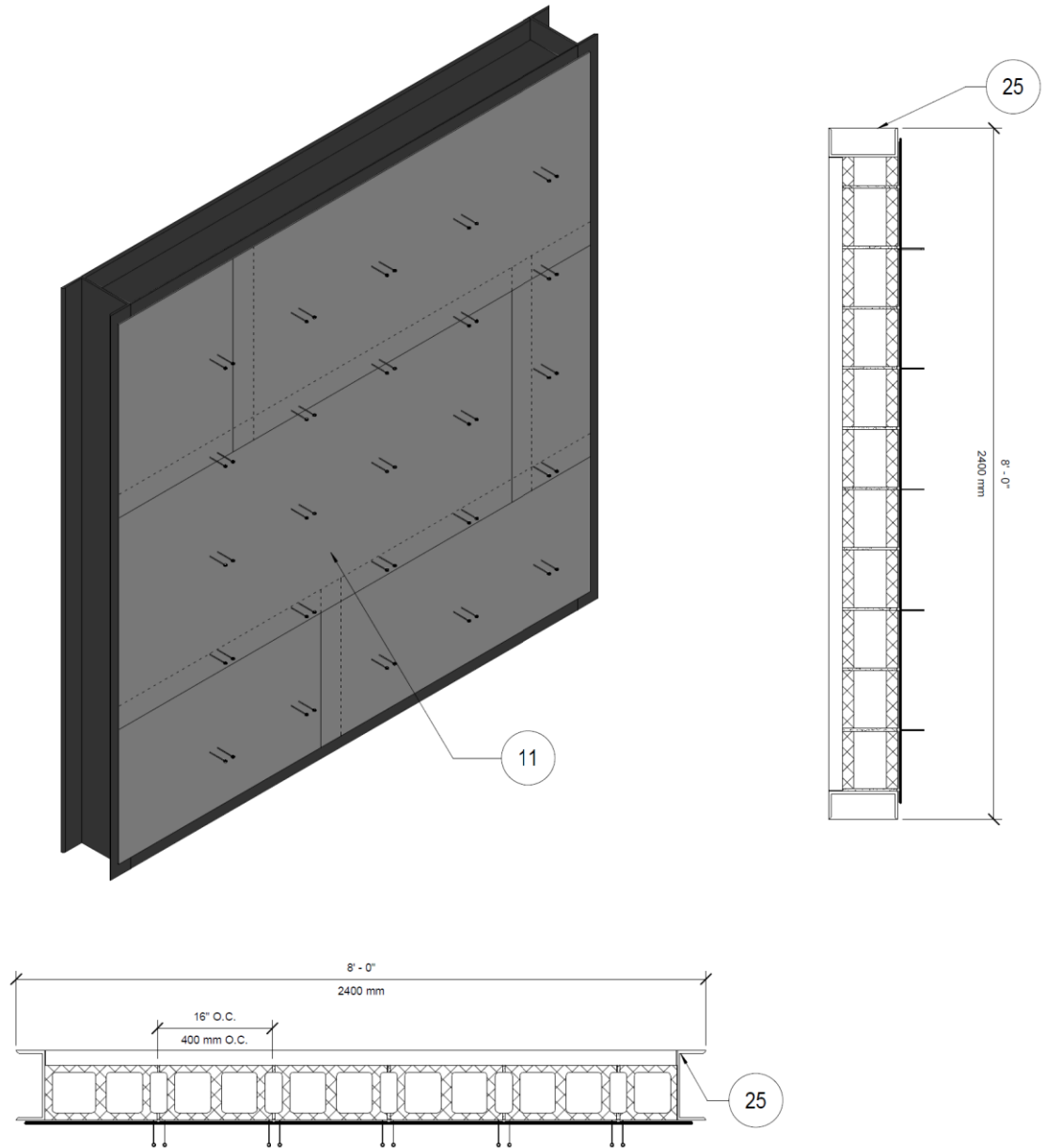


Figure 15
Base Wall: CMU Specimen – Air and/or water-resistive
Barrier Installed

C.6 CMU Construction Wall Specimen with Penetrations and Terminations

Construct a second specimen following the exact requirements as specified in Annex Section C.5 except brick ties are not required and the wall specimen shall include the following

- A A window rough opening constructed in the wall measuring 800 mm by 800 mm including:
 - 1. A single 50 mm x 100 mm (2-inch x 4-inch) wood plate installed at the top and bottom of the rough opening between two stud openings.
 - 2. A window blank [13] constructed with outside dimensions of 750 mm by 750 mm (30-inch x 30-inch) nominal, leaving a 12 mm (1/2-inch) space between the rough opening and the blank window.
 - a. The blank window includes a bare, medium density plywood window blank sealed and secured into a rabbeted wood buck.
- B Surface-mounted [14,16] and recessed [15,17] junction boxes.
 - 1. The boxes may be proprietary and form part of the continuity of the proprietary air barrier assembly or conventional boxes that are air sealed with air barrier materials and/or accessories.
 - 2. The published test report shall state the methodology used to seal junction boxes.
- C A PVC pipe [18] with a 38 mm (1 ½-inch) nominal outside diameter.
 - 1. The hole made in the substrate to install the pipe shall be 60 mm (2 ¼-inch) diameter to allowing an approximately 12 mm (1/2 inch) gap between the pipe and the rough opening hole in the sheathing around the pipe.
- D A galvanized steel duct [19] measuring 100 mm by 100 mm (4-inch x 4-inch)

1. The hole made in the substrate to install the duct shall be 125 mm by 125 mm (5-inch x 5-inch) nominal to allowing an approximately 12 mm (1/2 inch) gap between the duct and the rough opening hole in the sheathing around the duct.

Specimen C.6 CMU Construction with Penetrations and Terminations

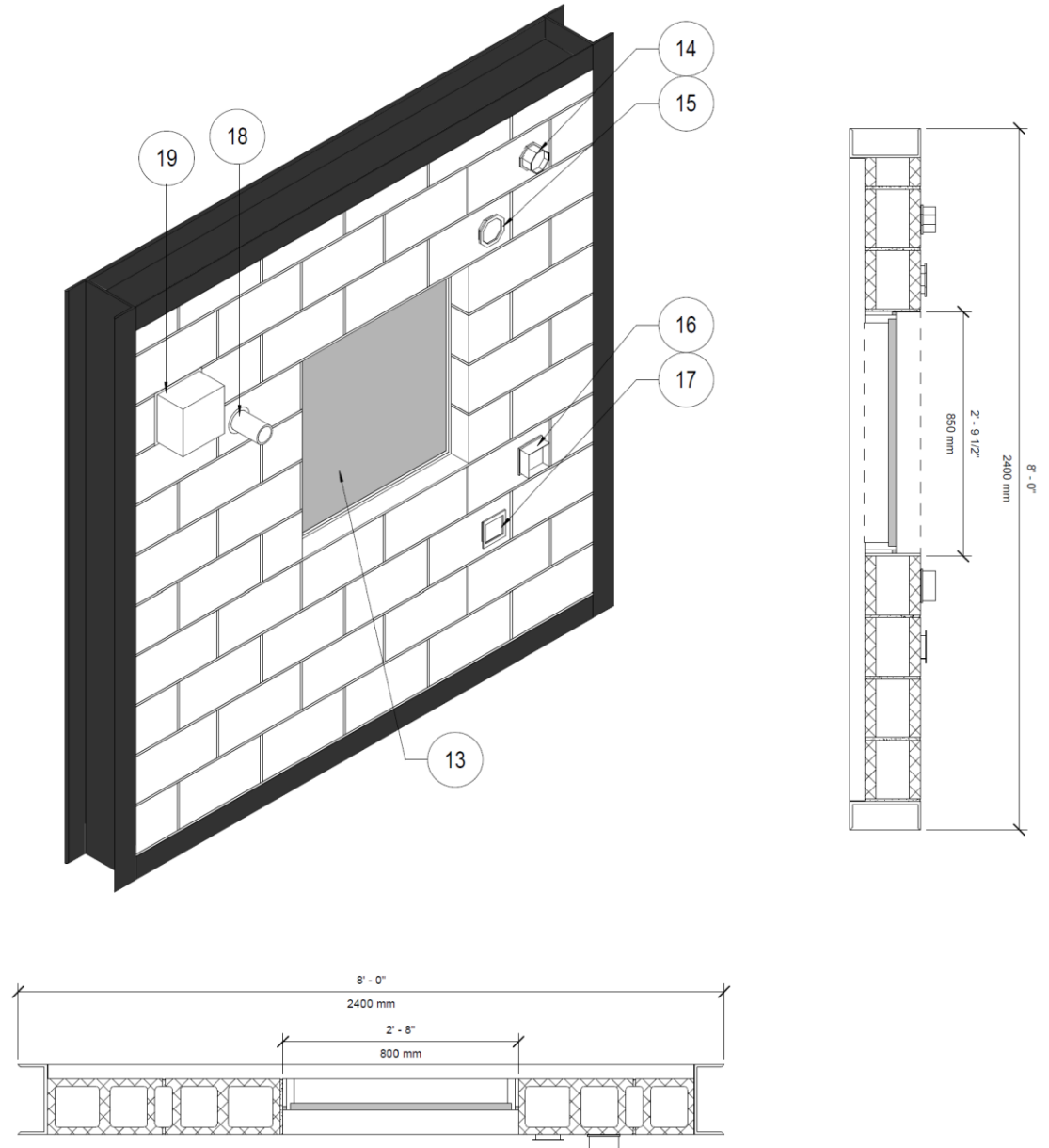


Figure 16
Base Wall: CMU Specimen – Exterior View with Penetrations

Specimen C.6 CMU Construction with Penetrations and Terminations

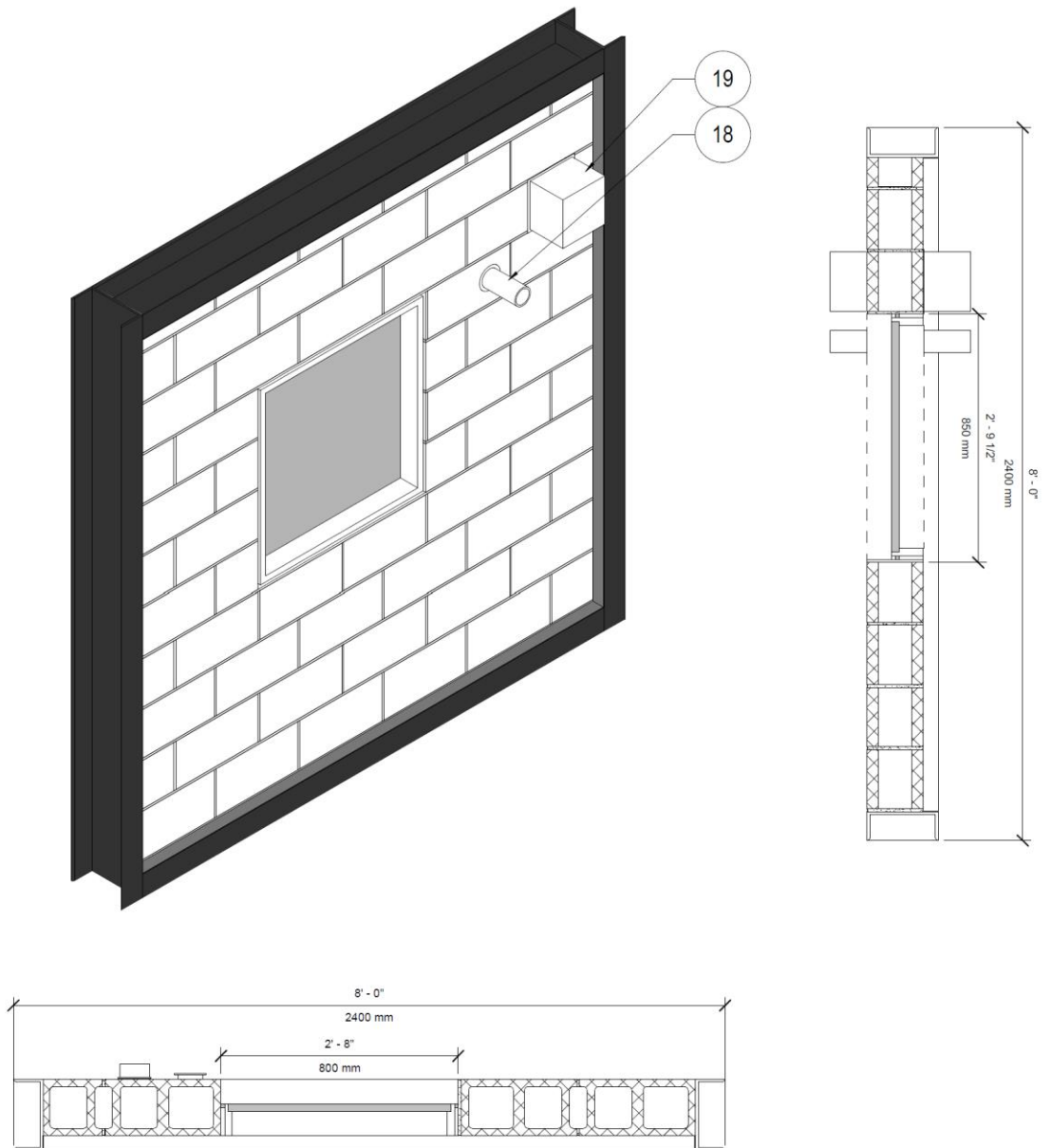


Figure 17
Base Wall: CMU Specimen – Interior View with Penetrations

Specimen C.6 CMU Construction with Penetrations and Terminations

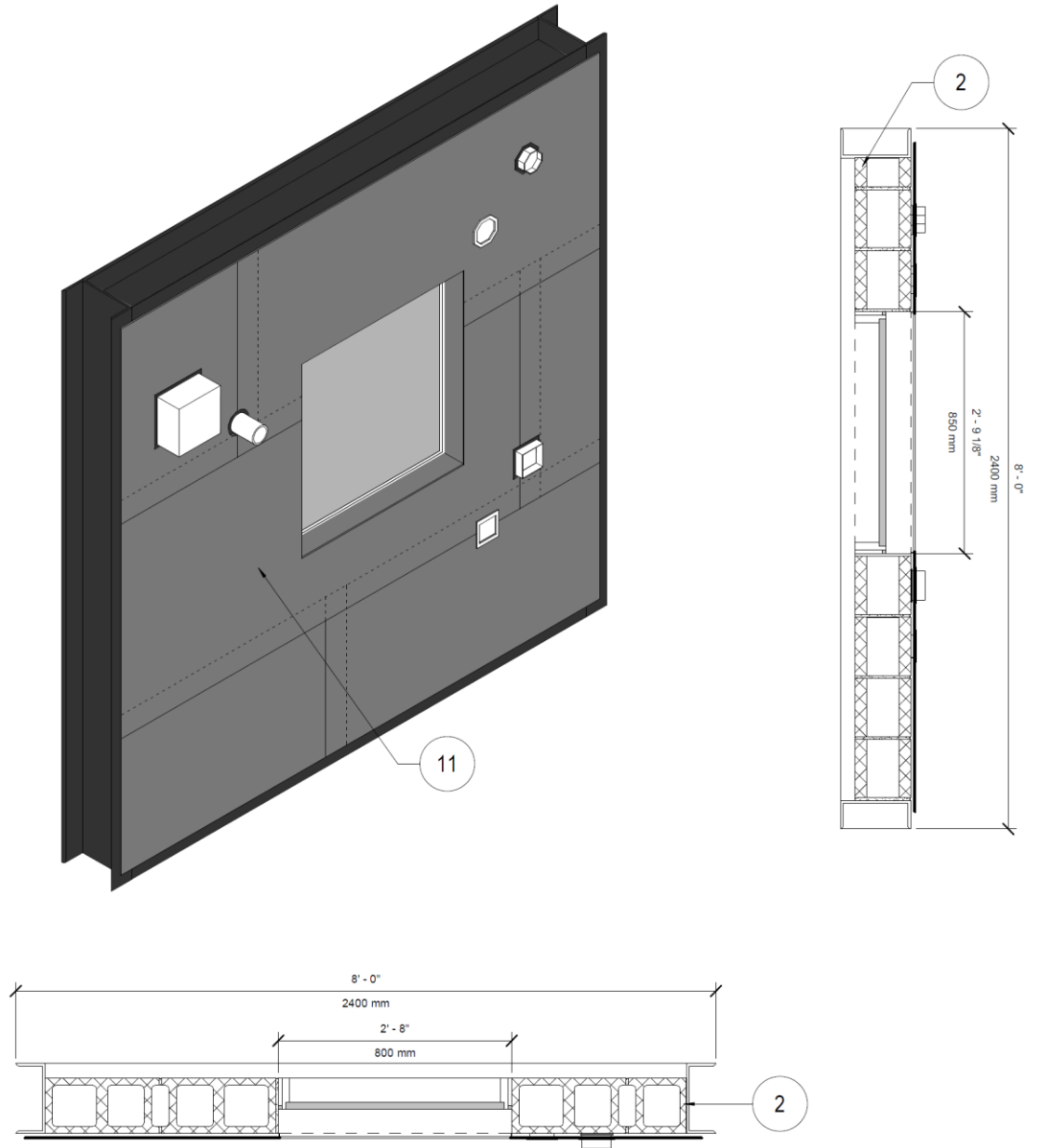


Figure 18
Base Wall: CMU Specimen - Exterior View with Air and/or

Water-resistive Barrier Installed with Penetrations