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| Technical Steering Committee Approval |

Voluntary Laboratory Test Method to Qualify **Vertical** Fenestration Installation Procedures

**DRAFT**
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0.0 FOREWORD

Introduction

Fenestration manufacturer’s instructions are the primary basis for installation. However, in terms of the fenestration interface with the building envelope, there are many variations of installation possible. The purpose of this test method is to evaluate or validate those methods/variations. The Installation Masters™ Program and/or ASTM E2112 are the basic guides to installation and shall be followed when possible. Other specific window wall and enclosure systems are detailed further in standard practices such as ASTM E2112, AAMA 2400, AAMA 2410, and all those developed by the FMA/AAMA/WDMA Installation Committee (FMA/AAMA 100, FMA/AAMA 200, FMA/WDMA 250, FMA/AAMA/WDMA 300 and FMA/AAMA/WDMA 400). Based on the variety of wall constructions available, and the use of various sealant and flashing materials and methods, this document is not intended to specify various component products used except in generic terminology. The actual method of installation and materials meeting the requirements of this test method shall be specified in Report Section 10.11.0 Report.

Note 1: There are certain basic, yet integral, installation requirements specified by the fenestration manufacturer’s instructions to meet rated performance. Serious consideration should be made prior to deviating from these specifications:

- Sill pan and/or flashing requirements
- Installation tolerances when installing the product: square, plum, level and rough opening clearance
- Selection of fastener type, embedment and spacing
- Shim placement (type of shim)
- Application of the interior air seal (This step is as important to the integrity of the installation as the sill pan requirement and completes the control of any unintended water beyond the interior plane of the fenestration product. If this step is not part of the installation guideline it will be left out during field testing)
- Drip Cap recommendation

It is not practical to test every possible fenestration installation condition; however, if a test of a specific installation condition is desired, this voluntary test method may be used. The purpose of this voluntary laboratory test method is to qualify fenestration installation methods based upon laboratory measurements of air leakage and water penetration resistance in new construction applications.

This standard practice laboratory test method is intended to examine the performance and durability of the integration between of a fenestration product and with the air & water barrier of the building envelope. Thus, test pressures for air, water, and structural loading in this standard practice are aligned with performance levels expected for this integration. Two exposure categories are defined, one for extreme wind/water exposure and commercial type structures and one for moderate wind/water exposure and non-commercial type structures. There is no intention to examine the structural integrity or air & water resistance of the fenestration product unit itself.

1.0 SCOPE

1.1 There are many variations of installation possible. The Installation Masters™ Program and/or ASTM E2112 are the basic guides to installation and shall be followed when possible. Other specific window wall and enclosure systems are detailed further in standard practices such as AAMA 2400, AAMA 2410, and all those developed by the
1.1 This test method is intended to examine the performance and durability of the integration of a fenestration product with the building envelope.

1.2 This test method does not address all issues of durability of the various components used in the installation.

1.3 There is no intention to re-examine the initial air and water resistance or structural integrity of the framing or glazing components of the fenestration product itself as previously qualified by NAFS. This test method does not address anchorage of the fenestration product to the rough opening.

1.4 Terminology

In this specification, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the specification; “shall be permitted to be” is used to express an option or that which is permissible within the limits of the specification; “should” is used to express a recommendation or that which is advised but not required; and “may” is used to express possibility or capability. Notes accompanying sections do not include requirements or alternative requirements; the purpose of a note accompanying a section is to separate explanatory or informative material from the text. Notes to tables and figures are considered part of the table or figure and shall be permitted to be written as requirements.

Section 0.0 and any Notes not attached to figures and tables are non-mandatory.

1.35 The primary units of measurement in this document are metric. The values stated in SI units are to be regarded as the standard. The values given in parentheses are for reference only.

1.46 This document was developed in an open and consensus process and is maintained by representative members of AAMA and FGIA as advisory information.

2.0 PURPOSESIGNIFICANCE AND USE

2.1 This test method is intended to be used to qualify installation materials and methods that do not follow the fenestration industry standard manufacturers practices installation instructions or industry standard practices, and to provide a means to benchmark the performance of any these installation methods and materials, but may be used when the proponent feels they have a valid installation.
NOTE 1: Users of this test method should be advised that the performance of installations may vary for window and door products larger other than those tested.

2.2 This document provides a laboratory test method by which the performance of a particular installation method for interfacing a fenestration product with into a wall assembly is evaluated for suitability of use.

2.3 To test the durability of the installation, this method employs certain physical loading and temperature cycling conditions to simulate service conditions followed by air infiltration and water penetration resistance tests.

2.4 Any shape fenestration product configuration can be utilized with a minimum of 1 square meter size area by this test method.

Fenestration products used with this procedure shall be limited to exterior windows and doors. Installations of these fenestration products shall be tested using this methodology; however, the test assembly shall be permitted to be modified to appropriately allow for the size of the installed product, while maintaining a minimum of 610 mm (2 ft) of wetted opaque sheathing wall space around the installed product. When testing doors, a minimum of 152 mm (6 in) of wetted opaque sheathing wall space shall be provided below the door sill or threshold.

NOTE 2: Using a non-operating unit is recommended to minimize air and water infiltration through the unit.

3.0 REFERENCED DOCUMENTS

3.1 References to the standards listed below in this section shall be to the edition indicated. Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

3.2 American Architectural Manufacturers Association (AAMA), Fenestration and Glazing Industry Alliance (FGIA) Standards

AAMAWDMA/CSA 101/1.5.2/A440-17, North American Fenestration Standard/Specification for windows, doors, and skylights (NAFS)

AAMA 711-13, Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration Products

AAMA 712-14, Voluntary Specification for Mechanically Attached Flexible Flashing

AAMA 714-192, Voluntary Specification for Liquid Applied Flashing Used to Create a Water-Resistive Seal around Exterior Wall Openings in Buildings
AAMA 800-160, Voluntary Specification and Test Methods for Sealants

AAMA 812-04(2010), Voluntary Practice for Assessment of Frame Deflection When Using Single-Component Aerosol Expanding Polyurethane Foams for Air-Sealing Rough Openings of Fenestration Installations

AAMA 2400-10, Standard Practice for Installation of Windows with a Mounting Flange in Open Stud Frame Construction for Low Wind/Water Exposure

AAMA 2410-13, Standard Practice for Installation of Windows with an Exterior Flush Fin Over an Existing Window Frame

AAMA AG-13, AAMA Glossary

3.3 ASTM International (ASTM)

ASTM C834-170, Standard Specification for Latex Sealants

ASTM C920-14, Standard Specification for Elastomeric Joint Sealants

ASTM E283/E283M-04(2012), Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen


ASTM E331-00(2016), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E547-00(2016), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference


ASTM E2112-10(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights

ASTM E2264-05(2013), Standard Practice for Determining the Effects of Temperature Cycling on Fenestration Products

3.4 Canadian Standards Association (CSA)

3.5.4 Fenestration Manufacturers Association (FMA) & American Architectural Manufacturers Association (AAMA)

FMA/AAMA 100-12, Standard Practice for the Installation of Windows with Flanges or Mounting Fins in Wood Frame Construction for Extreme Wind/Water Conditions

FMA/AAMA 200-12, Standard Practice for the Installation of Windows with Frontal Flanges for Surface Barrier Masonry Construction for Extreme Wind/Water Conditions

3.5.5 Fenestration Manufacturers Association (FMA), American Architectural Manufacturers Association (AAMA) & Window and Door Manufacturers Association (WDMA)

FMA/AAMA/WDMA 300-12, Standard Practice for the Installation of Exterior Doors in Wood Frame Construction for Extreme Wind/Water Exposure

FMA/AAMA/WDMA 400-13, Standard Practice for the Installation of Exterior Doors in Surface Barrier Masonry Construction for Extreme Wind/Water Exposure

3.5.6 Fenestration Manufacturers Association (FMA) & Window and Door Manufacturers Association (WDMA)

FMA/WDMA 250-10, Standard Practice for the Installation of Windows with Non-Frontal Flanges for Surface Barrier Masonry Construction for Extreme Wind/Water Conditions

3.6 Installation Masters Institute (IM)

IM-TM, Installation Masters™ Installer Training Manual

3.8 International Code Council

International Building Code (IBC) – 2015

4.0 DEFINITIONS

4.1 Please refer to the most current AAMA Glossary (AG-13) for all definitions except for those appearing below (which apply only to this test method).

4.1.1 AIR BARRIER FOAM SEALANT: Also referred to as expanding foam. An aerosol foam product dispensed as a bead into the air gap area around the fenestration perimeter to reduce the infiltration or ex-filtration of air between the fenestration product and the rough opening.
4.1.2 Air Leakage: Also referred to as air infiltration. According to ASTM E631, the passage of uncontrolled air through cracks or openings in the building envelope or its components, such as ducts, because of air pressure or temperature difference.

4.1.3 Drainage Path: An unobstructed water resistive path that provides continuous integration with the water resistive barrier (WRB) or wall system drainage plane that provides a means for water to exit the assembly.

4.1.4 PRELOAD: A positive and negative wind load (a reduced percentage of the design pressure) that is applied to a fenestration product or wall assembly to condition the system before running an air leakage, water penetration or structural test.

4.1.5 PROPONENT: The entity that orders the test, such as, but not limited to... This may be a window or component manufacturer, an installer, contractor, or builder, building owner, or designer.

4.1.6 SHIM: A thin, flat or wedge-shaped piece of wood or other suitable material used to level or plumb a fenestration product frame during installation.

4.1.7 WATER RESISTIVE BARRIER (WRB): The surface or surfaces of a wall system responsible for preventing air and water infiltration into the building interior.

5.0 SIGNIFICANCE AND USE

5.1 The specific installation method of interfacing the fenestration products into the wall system may have significant effects on the integrity of that wall. This document provides a laboratory test method by which a particular installation method can be evaluated.

5.2 This method employs certain physical loading and temperature cycling conditions to simulate service conditions followed by air infiltration and water penetration resistance tests.

5.3 The specific installation test method was written to accommodate a 1220 mm x 1220 mm (48 in x 48 in) direct set fixed window. Any shape fenestration product configuration with a minimum of 1 square meter size area can be utilized by this test method. The intent in using a direct set unit is recommended to minimize air/water infiltration through the window unit. Fenestration products that may be used with this procedure shall be limited to exterior windows and doors, sliding patio-type doors and swinging type doors, as used primarily in residential and light commercial buildings. Installations of these fenestration products shall be tested using this methodology; however, the buck test assembly shall be permitted to be modified to appropriately allow for the size of the installed product, while maintaining a minimum of 305610 mm (21 ft) 610 mm (2 ft) of wetted opaque perimeter wall space around the installed product (except when testing doors, there must be a minimum of 152 mm (6 in) of wetted sill conditions when testing doors).

65.0 SUMMARY OF TEST METHOD
This document consists of installing a fenestration product into a wall constructed in accordance with Section 62.0, and subjecting the installation system to a variety of performance tests in accordance with Figure 1. Wall construction is described in the following section.

**FIGURE 1: Flow Chart of Decision Points and Test Protocol Sequencing**

Wall construction is described in the following section.

7.0 NEW CONSTRUCTION TEST WALL APPARATUS

7.1 Test wall sections shall be built in accordance with Section 7.2.1.
The test wall and associated components shall be fully defined prior to installation. For general qualification purposes, the test wall shall be constructed in accordance with Section 7.2.1 for wood-based sheathing and framing. Alternative sheathing and framing materials or open frame construction are acceptable provided that the test wall meets the minimum dimensional requirements outlined in Section 7.2.1.

**NOTE X:** Where this test method is employed to compare the performance of two or more variations of installation methods or materials used to interface a fenestration product with a wall assembly, the test wall construction and fenestration product shall be otherwise identical. For direct performance comparisons between test units, they should be of equivalent configurations.

7.2.1 The minimum overall size of the test buck wall perimeter frame shall be a nominal 2500 mm x 2500 mm (96 in x 96 in) (See Fig 1). This test wall shall also serve as the base for the open frame construction when desired. The Test wall construction shall, at minimum, have a perimeter of nominal 50 mm x 150 mm nominal (2 in x 6 in) wood framing members, into which are placed at minimum nominal 50 mm x 100 mm nominal (2 in x 4 in) framing members. The loading in the wall shall be created to accommodate a fenestration product configuration with a minimum of 1 square meter size shall nominal 1220 mm x 1220 mm (48 in x 48 in) window and maintain the specified 9mm (3/8 in) minimum perimeter gap between the fenestration product and the test wall as specified by the proponent. The opening shall be centered in the test wall.
FIGURE 1: Needs title

96 in x 96 in TEST WALL PERIMETER
2 in x 6 in WOOD BUCK

ROUGH OPENING

2 in x 4 in FRAMING MEMBERS
16 in ON CENTER SPACING

Change to minimum test wall perimeter frame, change wood sizes to nominal
7.2.1.1 For sheathed wood frame construction, the surface of the framing shall be covered with wood structural sheathing, maximum 12 mm (1/2 in) thick, 12 mm (1/2 in) thick Plywood or Oriented Strand Board (OSB). The header of the rough opening shall be framed with a double 50 mm x 150 mm nominal (2 in x 6 in) wood member and the sill plate shall be a 50 mm x 100 mm nominal (2 in x 4 in) wood member, both supported by 50 mm x 100 mm nominal (2 in x 4 in) framing. Cripple studs shall be placed above and below the opening. All wood framing members shall be joined using 150 mm (3 in) drywall screws.
7.2.1.2 The plywood or Oriented Strand Board (OSB) sheathing shall be fastened to the wall framing material using 40 mm (1-5/8 in) drywall screws on 305 mm (12 in) centers. The plywood or Oriented Strand Board (OSB) joint shall be horizontally centered in the opening.

7.2.1.3 Unless otherwise specified the test wall, for either sheathed frame or open frame, shall be covered with a weather resistant water resistive barrier (WRB) installed in accordance with the manufacturers’ instructions.

NOTE 1: Unless otherwise specified in the proponent’s installation instructions, it is recommended that the WRB contain a minimum of one vertical and one horizontal joint located at the window to wall interface.

7.2.1.4 Alternative sheathing and framing materials are acceptable provided that the test wall meets the minimum construction requirements outlined in 7.2.1.

7.3 Test Unit

The window used shall be constructed to fit a nominal opening of 1220 mm x 1220 mm (48 in x 48 in) based on the window manufacturer’s standard size. Any shape fenestration product configuration that complies with Section 5.3, with a minimum of 1 square meter size area can be utilized by this test method. The window specimen shall be a standard direct set fixed window, glazed with an insulating glass unit, constructed with two lites, each with a minimum 3 mm (1/8 in) (DS) glass. The window shall also be permitted to be glazed with alternative materials provided it is glazed in such a manner as to simulate the relative stiffness of an insulating glass unit glazed with a minimum 3 mm (1/8 in) (DS) glass.

87.0 TEST SPECIMEN INSTALLATION

87.1 The test fenestration product installation shall be fully defined by written/published instructions which shall be attached to the published test report. Test results obtained shall apply only to the method of installation tested with no deviations.

87.2 Sealant, tape and air barrier foam sealant shall meet one of the following:

- AAMA 800-40, Voluntary Specification and Test Methods for Sealants (804.3)
- AAMA 800-40, Voluntary Specification and Test Method for Sealants (808.3)
- AAMA 800-40, Voluntary Specification and Test Method for Sealants (809.2)
- AAMA 800-10, Voluntary Specification and Test Method for Sealants (810.1)
- AAMA 812-04(2010), Voluntary Practice for Assessment of Single Component Aerosol Expanding Polyurethane Foams for Sealing Rough Openings of Fenestration Installations

Commented [M2]: Moved to Appendix A
• ASTM C834-10, Standard Specification for Latex Sealants
• ASTM C920-11, Standard Specification for Elastomeric Joint Sealants

87.3 Flashing used for the installation shall meet one of the following:

• AAMA 711-13, Voluntary Specification for Self Adhering Flashing Used for Installation of Exterior Wall Fenestration Products
• AAMA 712-14, Voluntary Specification for Mechanically Attached Flexible Flashing
• AAMA 714-12, Voluntary Specification for Liquid Applied Flashing Used to Create a Water-Resistive Seal around Exterior Wall Openings in Buildings

87.4 Proponent’s Installation Instructions

All installation products (fenestration products, sealant, flashing and WRB, etc.) shall be installed in accordance with proponent’s instructions provided that it does not conflict with the installation product manufacturer’s practices. When proponent’s installation instructions are not provided the installation products shall be installed in accordance with installation product manufacturer’s written instructions or other approved methods.

87.4.1 The proponent’s installation method and manufacturer’s installation instruction document/written instructions shall become a part of the test report. Specific attention shall be given to the components used in the installation. This shall include all relevant information such as anchorage fastener types, schedule and the amount of time between installation and testing, include their number, placement, application and size of anchorage fasteners.

87.5 To simulate penetrations from attached siding and in addition to tests without siding applied, it shall be permitted to specify and install a siding material on the test wall. The siding shall be installed in accordance with the siding manufacturer’s installation instructions. Where siding is included in the test for this purpose, the fastening of siding and trim components and location of fasteners shall be detailed in the test report. Apply standard roofing nails around the perimeter of the window. The nails shall have a 3 mm (1/8 in) shank, a 9 mm (3/8 in) head and 31 mm (1-1/4 in) length. Locate the nails 200 mm (8 in) apart, with 3 mm (1/8 in) standoff, 50 mm (2 in) from the frame of the window.

87.5.1 Fasteners shall be corrosion resistant and compatible with the materials contacted or penetrated.

87.6 Shim materials shall be adequate for each application. Shims for sill support require greater compressive strength. They are typically manufactured from high-impact plastic or metal and are capable of supporting a compressive load of 366 Pa (1100 psi). This capacity is particularly important for windows that support their entire weight on a narrow ridge or flange.

98.0 TEST PROCEDURE

See Figure 1 in Section 5.0 for a flow chart of steps described in this section and decision points.

Add a note for basis for testing, where did the numbers come from.
The complete test mockup as described in Sections 56.0, 67.0 and 78.0 inclusive of fenestration product, fasteners, sealant, flashing components and weather resistant water resistive barrier shall be included in this evaluation.

The completed mockup shall be preloaded in accordance with ASTM E330, Procedure A, prior to testing using 10 positive cycles of 480 Pa (10 psf) followed by 10 negative cycles of 480 Pa (10 psf).

The completed mockup shall first be tested for air leakage in accordance with ASTM E283/E283M at a minimum pressure differential of 75 Pa (1.57 psf). Air leakage through the installation system (interface of fenestration product and test wall) shall be determined in L/(s•m²) (cfm/ft²). The test shall be conducted in a manner that eliminates any leakage through the fenestration product and the test wall from the measured installation system leakage. This can be accomplished by masking the window-fenestration product and wall outside the installation area with an impermeable material. Air leakage shall not exceed that allowed by NAFS be measured and reported. Air infiltration tests at other test pressures shall be permitted to be conducted at the discretion of the proponent.

The completed mockup shall next be tested for water penetration resistance in accordance with ASTM E331 per at the proponent’s specified test pressure, but no less than of 150 Pa (3.0 psf), for a minimum of 1560 minutes. The completed mockup shall be tested to anticipated exposures. Note any water penetration through the installation system and the rough opening. Additional water penetration resistance tests at higher test pressures or durations shall be permitted to be performed at the discretion of the proponent.

NOTE 3: As guidance, the minimum specified water test pressure for U.S. applications should be 15% of the components and cladding structural design pressure for the intended use on the building project. For Canadian applications, the minimum test pressure should be based on the driving rain wind pressure (DRWP), as specified in CSA A440S1.

Next, the entire mockup shall be subjected to 14 twelve-hour durability temperature cycles in accordance with ASTM E2264 Method A, Level 1. Alternatively, the proponent may choose to test at either testing to Level 2 or Level 3 shall be permitted.

Following cycling, the mockup shall again be tested for air leakage as per Section 98.23 and water penetration resistance as per Section 98.34.

Finally, the entire mockup shall be tested for structural design pressure loads in accordance with ASTM E330 Procedure A. The purpose of design pressure structural test loads is to verify that the precondition the installation method used for subsequent re-evaluation of water and air resistance in accordance with Section 8.7 is capable of supporting the integration of the fenestration product (including sealants, flashing, tape, etc.) installed in the test wall integration. The test shall be performed at a the following minimum test pressure (load) pressures (excluding preload, proof load, and deflection measurements):
9.7.1 For Exposure Category 1, (typical for extreme wind/water exposure and commercial type structures) Commercial Type Construction (Type I, II, III per ...), 1440 Pa (30 psf) positive and negative.

9.7.2 For Exposure Category 2, (typical for moderate wind/water exposure and non-commercial type structures) Residential Type Construction (Type IV, V per ...), 575720 Pa (1215 psf) positive and negative.

9.7.3 The minimum structural design pressure test pressure shall be 1520 psf. Additional structural design pressure load tests at higher pressures shall be permitted to be performed at the discretion of the proponent. The purpose of structural test loads is to verify that the installation method under evaluation is capable of supporting a fenestration product mounted in the test wall without damaging the anchoring system at the minimum specified pressure of 1440 Pa (30 psf).

A higher design pressure structural test pressure and larger mockup size shall be permitted to be specified to satisfy specific project design pressure requirements.

9.8 Where necessary, battens or furring strips shall be permitted to be used. Siding, cladding, battens or similar features may be necessary to support non-structural elements, secure the water-resistive barrier material layer during design and structural pressure testing. However, the battens or furring strips shall be installed without providing additional support to or concealment of the fenestration unit or its interface with the wall assembly, including flashing materials.

9.8.1 Exception: when performing additional tests with siding installed in accordance with Section 7.5 including the case where the siding is intended to be supported by battens or furring strips. Such supporting features shall not interfere with the performance of the window-to-wall interface.

NOTE 4: As guidance, the minimum specified design pressure structural test pressure should be 150% of the components and cladding structural design pressure for the intended use on the building project.

9.8.2 After structural loading, all integration parts shall be inspected for integrity. Any damage, tears, displacement or deformation shall be reported. Air and water penetration testing shall be repeated in accordance with Section 8.3 with the results reported.

9.8.3 Any water penetration that is suspected of being unrelated to the installation under test shall be identified and eliminated or controlled in a fashion that will not interfere with the determination of pass/fail of the installation.

8.8 Finally, the mockup shall be tested for structural loads in accordance with ASTM E330 Procedure A. The purpose of structural test loads is to verify that the installation method under evaluation is capable of supporting the integration of the fenestration product (including sealants, flashing, tape, etc.) installed in the test wall integration.

NOTE 5: As guidance, the minimum specified structural test pressure should be is 150% of the components and cladding structural design pressure for the intended use on the building project.

Exception: Structural testing of Section 8.8 shall be permitted to be performed separately from the water- and air-leakage performance testing sequence of Sections 8.2 through 8.7. An installation procedure that has been successfully tested for...
structural performance in accordance with Section 8.8 shall be permitted to be separately evaluated for water- and air-resistance performance using Sections 8.2 through 8.7.

109.0 PERFORMANCE REQUIREMENTS

See Section 5.0, Figure 1 Appendix A for flow chart of steps described in this section and decision points.

109.1 Initial and final air leakage of the installation system shall be reported not exceed 0.08 L/s•m (0.05 cfm/ft) of fenestration product perimeter when tested in accordance with Section 9.3.

109.2 Initial water resistance tests shall be performed in accordance with Section 9.34. There shall be no water penetration through the installation system around the fenestration product perimeter beyond the defined drainage path at the test pressure specified.

9.2.1 Water penetration other than that related to the test interface shall not be considered part of the pass/fail but shall be reported.

10.3 Final air leakage shall not exceed 0.15 L/s•m (0.10 cfm/ft) of fenestration product perimeter when tested in accordance with Section 9.6.

10.4 Final water resistance tests shall be performed in accordance with Section 9.6. There shall be no water penetration through the installation system around the fenestration product perimeter beyond the defined drainage path at the test pressure specified.

NOTE 6: Deconstruction of the test assembly may be necessary to determine if water penetration occurred.

9.3 At the conclusion of both design pressure and structural load testing in accordance with Section 8.6, damage to the system that would prevent the fenestration product from operating normally shall be reported as a failure.

10.45 At the conclusion of structural load testing, there shall be no damage to the fenestration fastening system that would prevent the fenestration product from operating normally. After structural loading—design pressure load testing, all integration parts shall be inspected. Any damage, tears, displacement or deformation to those components, including the nature of any observed effect on operability of the fenestration product, shall be reported.

9.4 At the conclusion of structural pressure load testing in accordance with Section 8.8, failure of the fenestration product and installation components to sustain the specified structural test pressure, such as a breach resulting in depressurization, shall be reported as a failure. After structural pressure load testing, all integration parts shall be inspected. Any damage, tears, displacement or deformation to those components, including the nature of any observed effect on operability of the fenestration product, shall be reported but shall not be considered as a basis for failure where the structural load was successfully sustained.

Commented [DH6]: Added guidance for forensic inspection.
NOTE 1: The 9 mm (3/8 in) minimum perimeter gap shall be maintained around the fenestration product perimeter to allow a clear view of the space between the test wall and fenestration product for purposes of detecting water penetration beyond the installation system or into the wall cavity around the fenestration product.

NOTE 2: When an installation system requires a perimeter cavity filler material to reduce air leakage, prevent water penetration, or anchor the fenestration product structurally, two tests shall be required to qualify the installation system as follows:

The first test shall be conducted on the system without the perimeter cavity filler material. Structural cycling in accordance with Section 9.7 shall be optional for this test.

The second test shall be conducted on the system with the perimeter cavity filler material installed. Structural cycling in accordance with Section 9.7 shall be performed.

1110.0 REPORT

1110.1 The following information shall be reported by the test organization:

1110.1.1 Date of the Report
1110.1.2 Date of the Tests
1110.1.3 Humidity at the Time of Test
1110.1.4 Temperature at Time of Test
1110.1.5 Test Wall/Buck Construction

1110.1.5.1 When included in the test, the type and location of siding and trim fastening components

1110.1.6 Window Fenestration Unit Identification

1110.1.6.1 Fenestration Unit Window Description

1110.1.6.2 Dimensions

1110.1.6.3 Model Series Number

1110.1.6.4 Type

1110.1.6.5 Fenestration Unit Window Materials

Commented [DH7]: Removed for consistency
11.10.1.6.6 Any Other Pertinent Information

11.10.1.7 Installation Instructions for all components

11.10.1.7.1 Materials Used in the Wall Construction

11.10.1.7.2 Sealant Used and How and Where Used

11.10.1.7.3 Fasteners

11.10.1.7.3.1 Type

11.10.1.7.3.2 Spacing

11.10.1.7.4 WRB and Flashing: Describe which the product(s) used, including applicable standards, and method of installation

10.1.7.5 Siding (as applicable per Section 7.5)

11.10.1.8 Sequencing of Interface Components

11.10.1.9 Test Pressures Used for Each Test

11.10.1.10 Results of the Test all testing including test cycling parameters and the approved exposure category level.

11.10.1.11 Name and Address of the Testing Agency

11.10.1.12 Name and Address of the Manufacturer
## 10.2 Test Report Table

<table>
<thead>
<tr>
<th>Test Section</th>
<th>Description</th>
<th>Result Criteria (Section)</th>
<th>Result Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.2 Initial Pressure Loading</td>
<td>ASTM E330 @ 480 Pa (10 x cycles each)</td>
<td>No damage to fenestration unit or any integration components.</td>
<td></td>
</tr>
<tr>
<td>8.29.3 Initial air infiltration</td>
<td>ASTM E283/E283M @ 75 Pa (higher pressures acceptable as reported)</td>
<td>10.1 Report initial value in L/s•m², eliminate impact of Fenestration Unit</td>
<td></td>
</tr>
<tr>
<td>8.39.4 Initial water infiltration</td>
<td>ASTM E331 @ 150 Pa specified pressure for 1560 minutes (higher pressures acceptable as reported)</td>
<td>10.2 No water penetration around the fenestration unit beyond the defined drainage path</td>
<td></td>
</tr>
<tr>
<td>8.59.6 Air infiltration per 9.3 after thermal cycling</td>
<td>ASTM E283/E283M @ 75 Pa after thermal cycle per Section 98.4</td>
<td>10.1 Report initial value in L/s•m², eliminate impact of Fenestration Unit</td>
<td></td>
</tr>
<tr>
<td>8.59.6 Water infiltration per 9.4 after thermal cycling</td>
<td>ASTM E331 @ 150 Pa specified pressure for 1560 minutes after design thermal cycle per Section 98.4</td>
<td>10.2 No water penetration around the fenestration unit beyond the defined drainage path</td>
<td></td>
</tr>
<tr>
<td>8.79.8 Water infiltration per 9.4 after design pressure loading</td>
<td>ASTM E331 @ 150 Pa specified pressure for 1560 minutes after design pressure loading per Section 98.6</td>
<td>10.2 No water penetration around the fenestration unit beyond the defined drainage path</td>
<td></td>
</tr>
<tr>
<td>8.8 Structural performance 10.3 Fenestration Unit inspection after pressure loading</td>
<td>ASTM E330 @ specified structural test pressure per Section 8.8 (150% of design test pressure per Section 8.6) Applied pressure load per Section 98.7 and visual / operative inspection after pressure loading</td>
<td>No damage to fenestration unit that prevents normal operation at design test pressure per Section 9.3. No damage to fenestration unit or installation method that results in a failure to sustain the structural test pressure load per Section 9.4.</td>
<td></td>
</tr>
<tr>
<td>10.4 Full Unit inspection after structural loading</td>
<td>Applied structural load per Section 98.10 and visual / operative inspection after structural loading</td>
<td>No damage to fenestration unit that prevents normal operation. Report any damage, tears, displacement, or deformation to integration parts.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Test Report Table
APPENDIX A: TEST WALL DIMENSIONS FOR WOOD FRAME CONSTRUCTION AND SHEATHING

7.2.A1.0 The minimum overall size of the test wall perimeter frame shall be 2500 mm x 2500 mm (96 in x 96 in) (see Figure A1). The test wall shall, at minimum, have a perimeter of nominal 50 mm x 150 mm (2 in x 6 in) wood framing members, into which are placed at minimum nominal 50 mm x 100 mm (2 in x 4 in) framing members. The rough opening shall maintain the perimeter gap between the fenestration product as specified by the proponent. The opening shall be centered in the test wall.

FIGURE A1: Minimum Test Wall Framing Dimensions
7.2.A1.1 For sheathed wood frame construction, the surface of the framing shall be covered with wood structural sheathing, maximum 13 mm (1/2 in) thick (see Figure A2). The header of the rough opening shall be framed with a double 50 mm x 150 mm nominal (2 in x 6 in) wood member and the sill plate shall be a 50 mm x 100 mm nominal (2 in x 4 in) wood member, both supported by 50 mm x 100 mm nominal (2 in x 4 in) framing. Cripple studs shall be placed above and below the opening. All wood framing members shall be joined using 150 mm (3 in) drywall screws.

FIGURE A2: Test Wall with Sheathing
7.2.A1.2 The sheathing shall be fastened to the wall framing material using the sheathing manufacturer’s best practice installation instructions. A vertical plywood or OSB sheathing joint shall be located within the middle one-third of the rough opening width horizontally centered in the opening.

7.2.A1.3 Unless otherwise specified the test wall, for either sheathed frame or open frame, shall be covered with a WRB installed in accordance with the manufacturers’ instructions. The locations of joints in the test specimen shall be reported. NOTE 1: Unless otherwise specified in the proponent’s installation instructions, it is recommended that the WRB contain a minimum of one vertical and one horizontal joint located at the window to wall interface.