AAMA 502-02
Voluntary Specification for Field Testing of Windows and Sliding Glass Doors
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HOW TO USE THE SHORT FORM SPECIFICATION

To simplify the writing of field testing specifications for windows and sliding glass doors, AAMA has prepared a "Short Form Specification," which is recommended whenever possible. It may be used by merely inserting the following paragraph(s) into the project specifications.

SHORT FORM FIELD TESTING SPECIFICATION

1. Fenestration product(s) shall be field tested in accordance with AAMA 502-02, "Voluntary Specification for Field Testing of Windows and Sliding Glass Doors," using Test Method_________________________. (Insert A or B)

SPECIFIER NOTE: Test Method A shall be used unless Test Method B is selected here. See Section 2.0 for descriptions of both test methods. AAMA 502-02 specifies air leakage resistance and water penetration resistance field testing for one (1) fenestration product as soon as possible after installation begins and the selected fenestration product is determined to be ready for testing.

Default performance requirements for air leakage resistance and water penetration resistance are provided in Section 4.6 and 4.7.

SPECIFIER NOTE: For projects with less than 100 fenestration openings one field test sample is normally sufficient. Any of the following optional paragraphs may be added to modify the standard specification, however, consideration should be given to the cost of additional testing.

2. Test ____% (1% unless otherwise specified) of the fenestration products for air leakage resistance and water penetration resistance as specified at various stages of the product installation. Specifier note: If the tested fenestration product fails to comply with the project requirements consideration should be given to the selection and testing of additional fenestration products.

3. Air leakage resistance tests shall be conducted at a uniform static test pressure of ___ Pa (___ psf). The maximum allowable rate of air leakage shall not exceed ___ L/s•m² (___ cfm/ft²).

4. Water penetration resistance tests shall be conducted at a static test pressure of ___Pa (___ psf). No water penetration shall occur as defined in Section 4.11 of AAMA 502-02.
1.0 SCOPE AND PURPOSE

1.1 These specifications establish the requirements for field test specimens, apparatus, sampling, test procedures and test reports to be used in verifying the air infiltration resistance performance and water penetration resistance performance of installed new windows and sliding glass doors (hereafter referred to as "fenestration products"). Verifying the structural loading resistance performance of fenestration products is beyond the scope of this specification. This specification is applicable for testing during the construction process and prior to final acceptance by the owner.

If this procedure is adapted for field testing of fenestration products after completion and final acceptance by the owner, it shall be necessary to inspect the fenestration product prior to testing. Repair and/or replacement of damaged or deteriorated components, may be necessary, and shall be done by the responsible contractor(s). Refer to Section 3.4.1.

1.2 The purpose of these specifications is to provide a guide, which can be used to evaluate the installed performance of fenestration products for air leakage resistance and water penetration resistance under controllable and reproducible conditions.

1.3 The primary units of measure 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.

2.0 TEST METHODS

2.1 The field procedure and test apparatus shall meet the requirements of ASTM E 783 and ASTM E 1105.

NOTE: Two test methods are described below including the limitations of each. The methods differ in the location of the chamber perimeter line and, therefore, whether or not the perimeter seals, subframe/receptor system, and frame corners are subjected to the specified pressure differential. If not specified otherwise, Test Method A shall be the default. Test Method B is permitted to be specified by so noting in the Short Form Field Testing Specification.

2.2 Test Method A (Figure 1)
Test Method A is a test of the fenestration product within the confines of the perimeter of the main frame. Test specimens shall consist of the fenestration product as installed on the exterior of a building. If exterior screens are specified, they shall be in place during testing. Excluded in Test Method A are any joints, cracks or openings between the fenestration product and the adjacent wall construction. The test chamber shall be attached to the inside face of the main frame to create a pressure differential across the fenestration product within the confines of the main frame. (See Figure 1)

Only the operable elements (sash, vents, panels) and fixed glazing components shall be tested under the specified pressure for air leakage resistance and water penetration resistance.

NOTE: Non-structural interior trim and related items shall be removed as necessary to permit visual checks for water penetration through or around the fenestration product, exterior panning, subframe and/or receptor system. Specifically excluded from (or not measured by) Test Method A is "wall cavity" air that may be drawn from adjacent construction through "holes" in the fenestration product frame system or around interior trim and mullion covers. The design professional should review the shop drawings and the test specimens to see that the fenestration product manufacturer and installation contractor have taken adequate steps to seal balance clip holes, mounting fasteners, interior trim, mullion covers, self stacking window jambs and any other detail that may permit wall cavity air leakage past the interior plane of the glazing and/or framing.
The chamber attachment specified for Test Method A will not test the frame corner seals and perimeter members under pressure. Such elements, especially the bottom corners and sills, if improperly sealed may cause uncontrolled water penetration. This limitation of Test Method A should be clearly understood by the specifying authority, architect or owner's representative at the time the specifications are prepared. Since it is not practical to test these elements by this method, the following optional test (see Figure 2A, 2B and 2C) is permitted to be added to Paragraph 4 of the Short Form Field Testing Specification.

**Optional Sill Dam Test**

Fenestration product sills and subframe/receptor systems shall have a static water head height equal to the specified test pressure. (See Figure 2A for calculation of static water head). This shall permit plugging weep holes or building an exterior dam to hold water to the required depth. No water penetration as defined in Section 4.11 shall occur.

**SPECIFIER NOTE:** This optional water test requires the removal of interior finishes around the bottom of the fenestration product frame. The cost associated with the removal and replacement of the interior finishes must be understood and assigned prior to specifying this optional water test.
FIGURE 2A

STATIC WATER HEAD (mm) = 0.102 x SPECIFIED TEST PRESSURE (Pa)
STATIC WATER HEAD (inches) = 0.102 x SPECIFIED TEST PRESSURE (psf)

FIGURE 2B

FIGURE 2C
2.3 Test Method B (Figure 3)
Test Method B is a test of the fenestration product inclusive of the joint between the fenestration product and the rough opening. The test area shall consist of the fenestration product as installed on the exterior of a building inclusive of all joints, cracks or openings between the fenestration product and adjacent wall construction. The test chamber shall be applied to the wall construction in such a manner as to create a pressure differential across the entire fenestration product (including subframe/receptor and/or panning) and the perimeter seals. If exterior screens are specified they shall be in place during testing.

NOTE: This test method insures that the entire fenestration product (including the frame, corners, panning, subframe/receptor system, etc.) and the adjacent substrate including the perimeter seals are all tested under the prescribed pressure differential. Testing shall be performed as soon as possible after the fenestration product(s) are installed and prior to the installation of drywall or wall materials. If interior wall materials have been installed they shall be removed at the test area to allow visual access to these areas to check for water penetration, or other means of visual access shall be provided. The test chamber shall be applied to the wall system in such a manner as to apply a pressure differential to all joinery conditions and minimize extraneous air leakage. (See Section 4.5 for a detailed description of extraneous air leakage.) In the case of a stud wall system, the test chamber perimeter line, if installed on the building interior, would normally be taped to studs on both sides of the fenestration product and at the head and sill frame. Caulking would be required at the joinery between the stud framing and sheathing board or exterior wall to limit extraneous air leakage. On a precast wall system, a chamber installed on the interior can be sealed directly to the back of the precast. Tests on a segment of continuous horizontal strip fenestration products shall include adequate measures to properly seal horizontal head receptors and sill starters so that extraneous air leakage is minimized.
3.0 SAMPLING

3.1 As soon as practical after installation has begun, and a representative number of fenestration products have been completely installed, adjusted, cleaned and perimeter sealed, one product shall be tested for air leakage resistance and water penetration resistance as specified in Section 4.

NOTE: Performing the test as soon as practical on the job site may be beneficial in determining if manufacturing, installation and/or perimeter sealing problems are present before a substantial portion of the project is completed. Necessary corrections can be made without significant financial impact on any of the responsible parties. On large projects tighter construction monitoring may be performed by testing at approximate intervals of 5%, 50% and 90% completion of the installation. On jobs with fewer than 100 products, one field test sample as specified above should suffice. If more than the one product is specified for testing, the actual number of products and intervals of tests shall be stipulated in Paragraph 1 of the Short Form Field Testing Specification.

3.2 If any of the fenestration products under test fail to meet the prescribed air leakage resistance and water penetration resistance specifications, the reason for failure shall be determined by the responsible party and failed fenestration products or installation shall be repaired and retested. The remedial work shall be recorded and approved by the specifying authority, architect and/or owner. Upon satisfactorily passing a retest, the fenestration product or installation deficiencies shall become punch list items to check on the entire project.

3.3 The project specifications shall clearly identify the party responsible for the costs associated with the initial field testing and retesting (if necessary).

3.4 Testing shall be performed by an AAMA accredited testing agency.

NOTE: AAMA accredited laboratories are required to comply with AAMA 204-98 “Guidelines for AAMA Accreditation of Independent Laboratories Performing On-site Testing of Fenestration Products.” The requirement of AAMA accreditation assures the specifier that the laboratory has the staff, training, experience, and calibrated equipment to properly perform field testing.

3.4.1 The sponsor of the field testing shall be responsible for notification of the test schedule to the fenestration product installation contractor. The advance notice shall be adequate for the contractor to notify all fenestration product trades (i.e., manufacturer, erector, glazier, perimeter caulk contractor, etc.) of the test date.

3.5 Fenestration product(s) selected for testing shall conform to the following:

3.5.1 Fenestration product(s) location shall be selected by the architect or owner's representative unless delegated to the AAMA accredited testing agency.

3.5.2 The fenestration product(s) shall be representative samples of typical installations for the project. The fenestration product(s) shall have no outstanding punch list items, visible damage, nor be singled out because of obvious performance problems. If problems with a fenestration product installation are observed they shall be brought to the responsible contractor's attention and added to the project punch list.

3.5.3 After the fenestration product(s) locations have been selected, the owner's representative shall direct the responsible contractor, if necessary, to clean the fenestration product(s) and remove adjoining molding, insulation or other materials that could affect the test results. The designated fenestration product(s) shall be inspected to verify that it was installed according to the fenestration product manufacturer's installation instructions or per the approved shop drawings. In all cases the designated fenestration product(s) shall be installed plumb, level and square. The proper operation of the fenestration product(s) shall also be verified prior to testing.

NOTE: If test locations are not easily accessible from inside and outside, significant additional cost may arise for scaffolding, swing stage, electrical and water sources.

3.5.4 Upon completion of the testing, the responsible contractor shall replace or repair items removed in Section 3.5.3.

4.0 TEST PROCEDURES

4.1 Air leakage resistance and water penetration resistance tests shall be performed at pressures specified in Paragraphs 4.6 through 4.9 unless stipulated otherwise in the Short Form Field Testing Specification. Because these tests are conducted in the field, weather conditions can affect the static air pressure difference measurements. Steps shall be taken to minimize the effects of wind gusts. When such conditions can not be corrected, the range of static air pressure differences observed and the average static air pressure difference shall be recorded.

4.2 Air leakage resistance shall be determined per ASTM E 783.

4.2.1 The field air leakage resistance test consists of sealing a chamber to cover the interior or exterior face of the fenestration product to be tested, supplying air to or exhausting air from the chamber at a rate required to maintain the specified test pressure difference across the fenestration product, and measuring the resultant air flow through the fenestration product.
4.3 Water penetration resistance performance shall be determined per ASTM E 1105.

4.3.1 The field water penetration resistance test consists of sealing a chamber to the interior or exterior face of the fenestration product to be tested, supplying or exhausting air to the chamber at the rate required to maintain the desired air pressure difference across the fenestration product. Simultaneous to the application of air pressure difference water shall be applied to the exterior face of the fenestration product at the required rate while observing for any water penetration at the interior.

The fenestration product gaskets or weatherstrips shall be examined and shall be dry before proceeding with the air leakage resistance test.

4.4 Where both tests are to be conducted in sequence, the test for air leakage resistance shall be conducted before the test for water penetration resistance. If there is reason to believe that residual water from rain or other sources may be located in the fenestration product, a two-minute negative (outward) pressure test followed by a two-minute positive (inward) pressure test shall be conducted at the same pressure differentials used for the performance test to purge the fenestration product of any residual water.

4.5 Extraneous Air Test
(Only required if initial air leakage value exceeds the allowable value.)

**NOTE: Measuring Extraneous Air Leakage**

The intent of the air leakage resistance test (for both Test Methods A and B) is to measure only exterior air leakage through the sash crack, fixed glazing, hardware, etc., within the area enclosed by the fenestration product frame. This air shall be assumed to be coming from the exterior of the building directly through the fenestration product. Other sources of air leakage (i.e., through fastener holes in the side frames, frame corner seals around the frame, through interior trim and interior mullion covers, through exterior panning systems, through leakage in the testing equipment or air chamber attachment to the fenestration product) shall be referred to as extraneous air leakage and shall be accounted for.

**SPECIFIER NOTE:** For some projects it may be desirable to include all potential sources of air leakage. In those special cases the specifier must clearly identify the conditions (frame corners, subframes, panning etc.) that are to be included in the field air leakage measurement.

Extraneous air leakage shall be determined by applying a "blank," (usually thin plastic sheeting), to the exterior of the fenestration product. This is normally taped to the exterior frame. The net air passing through the fenestration product shall be calculated by subtracting the measured air leakage with the blank from the measured air leakage without the blank (gross air). All extraneous air leakage shall thereby be accounted for and mathematically removed by this procedure. However, it is not always feasible to blank the exterior of the fenestration product, due to height above the ground or weather conditions. An accepted practice shall be to measure air leakage without the blank on the exterior.

If the measured value (with extraneous air leakage included) is less than allowed, then no test with an exterior blank shall be required. If, however, the measured value is greater than allowed, then the extraneous air leakage shall be measured and used to calculate the net air leakage rate.

4.6 An air leakage resistance test shall be conducted at a minimum uniform static test pressure of 75 Pa (1.57 psf) or as specified for the project, but not to exceed 300 Pa (6.24 psf).

4.7 Unless otherwise specified, allowable rates of air leakage for field testing shall be 1.5 times the applicable ANSI/AAMA/NWWDA 101/LS.2 rate for the Product Type and Performance Class. Examples of allowable air leakage rates are shown below:

<table>
<thead>
<tr>
<th>Product Designation</th>
<th>ANSI/AAMA/NWWDA 101/LS.2</th>
<th>AAMA 502</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Allowable Air Leakage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test Pressure</td>
<td>Maximum Rate</td>
</tr>
<tr>
<td>H-R15</td>
<td>75 Pa (1.57 psf)</td>
<td>1.5 L/s•m² (0.3 cfm/ft²)</td>
</tr>
<tr>
<td>SGD-LC25</td>
<td>75 Pa (1.57 psf)</td>
<td>1.5 L/s•m² (0.3 cfm/ft²)</td>
</tr>
<tr>
<td>C-C30</td>
<td>75 Pa (1.57 psf)</td>
<td>1.5 L/s•m² (0.3 cfm/ft²)</td>
</tr>
<tr>
<td>H-HC40</td>
<td>75 Pa (1.57 psf)</td>
<td>1.5 L/s•m² (0.3 cfm/ft²)</td>
</tr>
<tr>
<td>AP-AW40</td>
<td>300 Pa (6.24 psf)</td>
<td>0.5 L/s•m² (0.1 cfm/ft²)</td>
</tr>
</tbody>
</table>

**NOTE:** The above information is for example only and is not a complete list of all fenestration product designations. Refer to Table 2.1 of ANSI/AAMA/NWWDA 101/LS.2 for a complete listing of all designations and maximum allowable air leakage rates.

4.8 The maximum allowable rates of air leakage for field testing shall not exceed 1.5 times the project specifications. However, these maximum allowable field testing rates shall not be expected to be less than the following:
<table>
<thead>
<tr>
<th>Product Type</th>
<th>AAMA 502 Recommended Minimum Specified Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed and Compression Seal Products (i.e. casements, awnings, hoppers, etc.)</td>
<td>0.5 L/s•m² (0.1 cfm/ft²)</td>
</tr>
<tr>
<td>Sliding Seal Products (i.e. hung windows, horizontal sliders, etc.)</td>
<td>1.0 L/s•m² (0.2 cfm/ft²)</td>
</tr>
</tbody>
</table>

**NOTE:** Rates lower than indicated above are considered to be unrealistic to consistently achieve in typical field tests.

4.9 Water penetration resistance tests shall be conducted at a static test pressure equal to 2/3 (0.667) of the test pressure specified for the applicable product designation in ANSI/AAMA/NWWDA 101/1.S.2. For example, a product rated as H-C50 shall be field tested at a pressure differential of 0.667 x 360 Pa (7.50 psf) = 240 Pa (5.00 psf).

**NOTE:** The specifier is permitted to increase the field water penetration resistance test pressure to the value specified for the project, however, this shall be stipulated in Paragraph 3 of the Short Form Field Testing Specification.

4.10 ASTM E 1105 specifies two procedures for water penetration resistance testing. Procedure A uses a uniform static test pressure and Procedure B uses a cyclic static pressure. Residential, Light Commercial and Commercial Performance Class fenestration products shall be tested per Procedure B, Architectural Class products per Procedure A and Heavy Commercial Class products per both.

4.11 Water penetration shall be defined as penetration of water beyond a plane parallel to the glazing (the vertical plane) intersecting the innermost projection of the test specimen, not including interior trim and hardware under the specified conditions of air pressure difference across the specimen. Any such water penetration shall constitute failure of the water penetration resistance test. It shall also constitute failure if water penetrates through the perimeter frame of the test specimen. Water contained within drained flashing, gutters, and sills shall not be considered failure.

5.0 TEST REPORTS

5.1 The report shall include the following information:

5.1.1 General
Testing agency, name of the individual(s) performing the tests, date and time of test, date of report, identification and location of the building.

5.1.2 Fenestration Product Description
Manufacturer, model, operation type, dimensions, materials, etc; identification and location of fenestration product(s) within the building; physical condition of fenestration product; description of any modifications made to the fenestration product; number of retests; etc.

5.1.3 Sampling Procedures
If applicable, describe or list the procedures established from Section 4.

5.1.4 Test Parameters
List or describe the specified static pressure differential used in the test, whether the chamber was affixed to the interior or exterior of the fenestration product and provide a detailed description (to include sketches showing location, if appropriate) of the chamber attachment to the fenestration product. Clearly identify any elements of the fenestration product that were not tested.

5.1.5 Test Results
Record the actual and allowable rates of air leakage and record all points of water penetration. Indicate whether or not extraneous air leakage was measured. Record unusual weather or test conditions.

5.1.6 Compliance Statement
Make a statement that the tests were conducted in accordance with this method or completely describe any deviation. Also, state whether or not the results indicate compliance with the field testing specification requirements.

6.0 REFERENCE SECTION

References to the standards listed below shall be to the edition indicated.

ANSI/AAMA/NWWDA 101/1.S.2-97, “Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors”

AAMA 204-98, “Guidelines for AAMA Accreditation of Independent Laboratories Performing On-site Testing of Fenestration Products”


ASTM E 1105-00, “Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference”