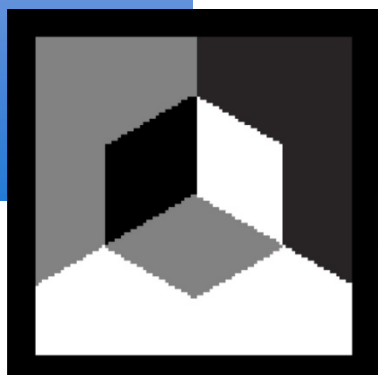
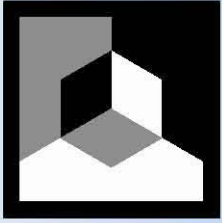


AAMA 502-08

**Voluntary Specification for  
Field Testing of Newly  
Installed Fenestration  
Products**





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## HOW TO USE THE SHORT FORM SPECIFICATION

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To simplify the writing of field testing specifications for fenestration products, AAMA has prepared the following "Short Form Specification" for use by architects/specifiers. It may be used by merely inserting the following paragraph(s) into the project specifications. Please note that Specifier Notes in italics are not to be inserted into the project specifications.

### SHORT FORM FIELD TESTING SPECIFICATION

1. Newly installed fenestration product(s) shall be field tested in accordance with AAMA 502, "Voluntary Specification for Field Testing of Newly Installed Fenestration Products."

*SPECIFIER NOTE 1: See Section 2.0 for a description of the test method. AAMA 502 specifies air leakage resistance and water penetration resistance field testing of fenestration product specimens during construction and prior to issuance of the building occupancy permit.*

2. Test three (unless otherwise specified) of the fenestration product specimens after the products have been completely installed for air leakage resistance and water penetration resistance as specified.

*SPECIFIER NOTE 2: The number of specimens to be selected for testing on a project should be determined after careful consideration of the following factors:*

- *What will be the cost impact of the quantity and location of specimens selected for testing? (See Section 3.5.3).*
- *Selecting a large number of specimens on a small project (fewer than 50 fenestration products) is normally not cost effective, and as few as one specimen may provide the information needed.*
- *On all projects, regardless of size, the specifier should determine how many specimens are required in order to establish a reasonable measure of quality for the entire project. ASTM E 122 provides guidance on how to establish the number of test specimens in order to estimate a measure of quality of a production lot with prescribed precision.*
- *The specifier must carefully balance the cost of specimen or specimen preparation, as well as the cost of testing and the restoration of the project surrounding components and finishes to their original condition, before determining the number and location of specimens to be tested. On larger projects, a formal cost-benefit analysis is appropriate. On smaller projects, the specifier should avoid a situation where the cost of testing and building restoration approaches the cost of the fenestration products. If any of the tested fenestration products fail to comply with the project requirements, consideration should be given to the selection and testing of additional products.*
- *If water leakage is observed and the source of the leakage cannot be determined, a forensic evaluation using the procedures outlined in AAMA 511 shall be performed while maintaining the test pressures and methods defined in AAMA 502.*

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•m<sup>2</sup> (\_\_\_ cfm/ft<sup>2</sup>).

*SPECIFIER NOTE 3: The field test pressure for air leakage resistance shall be equivalent to the test pressure originally used in the laboratory to test the product or achieve a laboratory performance rating. The allowable rates for field air leakage testing shall be a minimum of 1.5 times the tested or rated laboratory performance (see Section 4.2.4 for default performance requirements).*

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 4.3.4 of AAMA 502.

*SPECIFIER NOTE 4: When selecting static water test pressure to be tested at the job site, in no case shall the specified test pressure exceed 2/3 of the tested or rated laboratory performance (see Section 4.3.2 for default performance requirements).*

## 1.0 SCOPE AND PURPOSE

**1.1** This specification establishes 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 newly installed fenestration products. This specification is applicable during construction, prior to issuance of the building occupancy permit but no later than six months after installation of the fenestration product. For the purpose of this document, fenestration products are defined in AAMA/WDMA/CSA 101/I.S. 2/A440. Specifically excluded are curtain walls, sloped glazing and storefront systems; these systems shall be tested per AAMA 503 as required. Verifying the structural loading resistance performance of fenestration products is beyond the scope of this specification.

If field testing of fenestration products is required after the building occupancy permit has been issued or more than six months after product installation, AAMA 511 shall be used. Additionally, in the event that water penetration testing using the test methods outlined in this specification

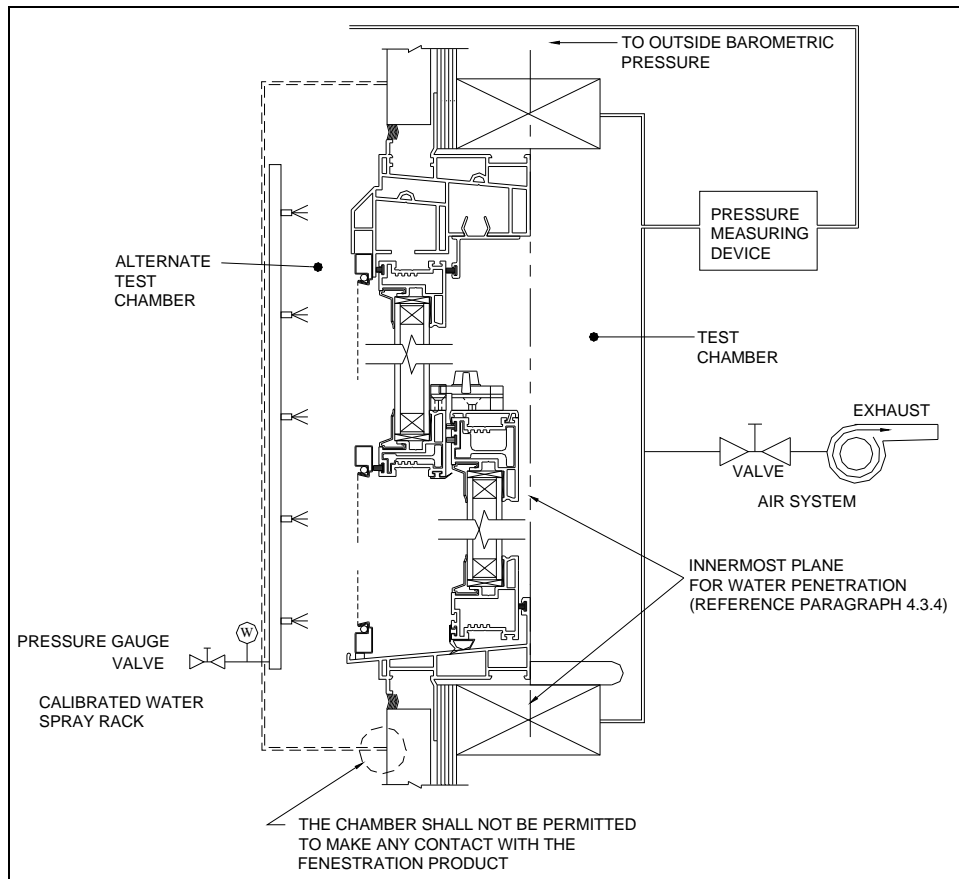
produces water infiltration that cannot be solely attributed to the fenestration product, forensic testing shall be initiated by using AAMA 511 and ASTM E 2128. The determination of the sources of water penetration from other than the fenestration product requires forensic investigation and testing outside the scope of this specification.

**1.2** The purpose of this specification is to provide a method which can be used to evaluate the installed performance of fenestration products for air leakage resistance and water penetration resistance under controllable, reproducible and appropriate 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.



**FIGURE 1- TEST CHAMBER**

## 2.2 TEST CHAMBER ARRANGEMENT

The test chamber shall be attached and sealed to the wall/roof construction in such a manner as to create a pressure differential across the entire specimen (including subframe/receptor and/or panning) and the perimeter seals (see Figure 1).

**NOTE 1:** Wind and other environmental conditions (barometric pressure, rain and temperature changes) can have an adverse impact on field testing performance; therefore the specimen should be isolated from adverse ambient conditions with a barrier and conditioned if necessary to protect it from any environmental condition which may affect the test results. If testing must be performed under conditions that would affect the test results, such as extreme temperatures, high winds or other adverse environmental conditions, these conditions shall be noted in the report. Any test performed without appropriate consideration and adjustment for ambient conditions shall render the test results invalid.

**2.2.1** Testing shall be performed as soon as possible after the fenestration product(s) is installed, and prior to the installation of drywall or interior finish wall/roof materials. If interior finish wall/roof 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.

**2.2.2** The test chamber shall be applied to the wall/roof system in such a manner as to apply a pressure differential to all joinery conditions and minimize extraneous air leakage (see Section 4.2.2 for a detailed description of extraneous air leakage).

**2.2.2.1** In the case of a stud wall/roof system, the test chamber perimeter line, if installed on the building interior, would normally be attached to studs on both sides of the specimen and at the head and sill framing.

**2.2.2.2** On a precast wall/roof system, a chamber installed on the interior can be sealed directly to the back of the precast panel.

**2.2.2.3** Special sealing consideration shall be given to the testing of continuous strip windows. 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 and water control is maintained.

## 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, three installed fenestration product specimens shall

be tested for air leakage resistance and water penetration resistance as specified in Section 4.0.

**NOTE 2:** Performing the field test as soon as practical may be beneficial in determining if manufacturing, installation and/or perimeter sealing problems are present before a substantial portion of the project is completed. If the initial testing is performed early in the project installation process, 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. Three field test specimens as specified above is the default quantity. If more than, or less than, three specimens are to be tested, the number of specimens and intervals of testing shall be stipulated in Paragraph 2 of the Short Form Field Testing Specification.

**3.2** If any of the specimens do not conform to the prescribed air leakage resistance and water penetration resistance requirements, the manufacturer and/or the installer shall be afforded the opportunity to perform a site inspection and determine the reason for non-compliance. Non-compliant specimens shall be repaired as required and retested. The remedial work shall be recorded and approved by the specifying authority, architect and/or owner. Upon satisfactorily passing a retest, the remedial work performed shall become punch list items to randomly check for similar conditions on the remainder of the project.

If water leakage is observed and the source of the leakage cannot be determined, a forensic evaluation using the procedures outlined in AAMA 511 shall be performed while maintaining the test pressures defined in the field testing specifications, and employing the test methods defined in AAMA 502.

**3.3** The project specifications and/or the contract documents shall clearly identify the party responsible for the costs associated with the initial field testing, retesting and forensic testing (if necessary).

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

**NOTE 3:** AAMA accredited laboratories are required to comply with AAMA 204, "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 notify the fenestration product installer and manufacturer of the test schedule. The advance notice shall be a minimum of one week in advance of the testing in order for the installation contractor to notify all fenestration product trades (i.e.,

erector, glazier, perimeter caulk contractor, etc.) of the scheduled test date.

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

**3.5.1** Specimen location shall be selected by the architect or owner's representative unless delegated to the AAMA accredited independent testing agency or building envelope consultant.

**3.5.2** The fenestration product(s) shall be representative specimens of typical installations as specified for the project. The specimen(s) shall have no outstanding punch list items, visible damage or irregularities, nor be singled out because of obvious performance problems. If problems with a specimen installation are observed, they shall be brought to the responsible contractor's and/or manufacturer representative's attention and added to the project punch list. If exterior screens are specified, they shall be in place (closed) during testing.

**3.5.3** After the specimen(s) locations have been selected, the owner's representative shall direct the responsible contractor and/or manufacturer representative to remove interior finishes (if necessary) to clean the specimen(s) and check for proper operation. Care shall be taken not to disturb the interior side air seal, if present. Interior or exterior components that are required for product performance shall not be removed as some product installations require an interior air seal to perform as designed.

The designated specimen(s) shall be inspected by the testing agency. The pretest inspection shall include the checking and recording of the following in the test report:

- The plumb, level and square of the specimen.
- The operation of the specimen.
- The designed drainage path of the specimen.
- The pre-test condition of all surfaces to confirm that they were in a condition where a judgment can be made as to whether or not water penetration is a result of this testing.

If the selected test locations are not easily accessible from both the inside and outside, significant additional cost may arise for scaffolding, swing stage, electrical and water sources. If identical products are installed at more accessible locations, these locations shall be selected for testing. Whenever possible, the architect/specifier shall define the field testing requirements in the project specifications, including the number of tests and their location. This will provide some assurance that consideration has been given to the complexity of the field testing prior to bidding, and further communicate the requirements to those who will be responsible for, or involved in, the field testing.

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

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## 4.0 TEST PROCEDURES

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**4.1** Air leakage resistance and water penetration resistance tests shall be performed at pressures specified in Sections 4.2.3 and 4.2.4 unless otherwise stipulated in the Short Form Field Testing Specification. 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 specimen, a two-minute negative (outward) pressure test followed by a two-minute positive (inward) pressure test shall be conducted at the same pressure differential used for the performance test to purge the specimen of any residual water. The specimen gaskets or weatherstrips shall be examined and shall be dry before proceeding with the air leakage resistance test.

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

**4.2.1** The field air leakage resistance test consists of supplying air to or exhausting air from the field erected test chamber at a rate required to maintain the specified test pressure difference across the specimen, and measuring the resultant air flow through the specimen.

**4.2.2 Extraneous Air Test** (only required if initial air leakage value exceeds the allowable value)

Extraneous air leakage shall be determined by applying a "blank" (usually thin plastic sheeting) taped to the exterior side of the frame if only the specimen is being tested, or taped to the surrounding building weather resistive barrier if both the specimen assembly and its installation are being tested. The net air passing through the specimen 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 specimen 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, 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.

**4.2.3** An air leakage resistance test shall be conducted at a minimum uniform static test pressure of 75 Pa (1.6 psf) or as specified for the project, but not to exceed 300 Pa (6.2 psf).

4.2.4 Unless otherwise specified, allowable rates of air leakage for the specimen shall be 1.5 times the applicable AAMA/WDMA/CSA 101/I.S. 2/A440 rate for the Product

Type and Performance Class, rounded down to one decimal place. Examples of allowable air leakage rates are shown in Table 1 below:

Product Designation	AAMA/WDMA/CSA 101/I.S.2/A440		AAMA 502	
	Allowable Air Leakage		Allowable Air Leakage	
	Test Pressure	Maximum Rate	Test Pressure	Maximum Rate
H-R15	75 Pa (1.6 psf)	1.5 L/s•m <sup>2</sup> (0.3 cfm/ft <sup>2</sup> )	75 Pa (1.6 psf)	2.2 L/s•m <sup>2</sup> (0.45 cfm/ft <sup>2</sup> )
SD-LC25	75 Pa (1.6 psf)	1.5 L/s•m <sup>2</sup> (0.3 cfm/ft <sup>2</sup> )	75 Pa (1.6 psf)	2.2 L/s•m <sup>2</sup> (0.45 cfm/ft <sup>2</sup> )
C-C30	75 Pa (1.6 psf)	1.5 L/s•m <sup>2</sup> (0.3 cfm/ft <sup>2</sup> )	75 Pa (1.6 psf)	2.2 L/s•m <sup>2</sup> (0.45 cfm/ft <sup>2</sup> )
AP-HC40	300 Pa (6.2 psf)	1.5 L/s•m <sup>2</sup> (0.3 cfm/ft <sup>2</sup> )	300 Pa (6.2 psf)	2.2 L/s•m <sup>2</sup> (0.45 cfm/ft <sup>2</sup> )
F-AW40	300 Pa (6.2 psf)	0.5 L/s•m <sup>2</sup> (0.1 cfm/ft <sup>2</sup> )	300 Pa (6.2 psf)	0.7 L/s•m <sup>2</sup> (0.15 cfm/ft <sup>2</sup> )

**TABLE 1**

**NOTE 4:** The above information is for example only and is not a complete list of all fenestration product designations. Refer to Table 25 in AAMA/WDMA/CSA 101/I.S.2/A440-05 or Table 27 in AAMA/WDMA/CSA 101/I.S.2/A440-08 for a complete listing of all designations and maximum allowable air leakage rates.

4.3 Water penetration resistance performance shall be determined per ASTM E 1105 using Procedure B “cyclic static air pressure difference,” except for AW windows which shall be tested using Procedure A, “uniform static air pressure difference.” The test pressure shall not be less than 91 Pa (1.9 psf).

4.3.1 The ASTM E 1105 test consists of sealing a chamber to the surrounding conditions adjacent to the specimen to be tested, and supplying or exhausting air to the chamber at the rate required to maintain the desired air pressure difference across the specimen. Simultaneous to the application of air pressure difference, water shall be applied to the exterior face of the specimen at the required rate while observing for any water penetration at the interior.

4.3.2 Water penetration resistance tests shall be conducted at a static test pressure equal to 2/3 of the tested and rated laboratory performance test pressure as indicated by the applicable product designation in AAMA/WDMA/CSA 101/I.S. 2/A440. For example, a product tested or rated as H-C50 shall be field tested at a pressure differential of 0.667 x 360 Pa (7.5 psf) = 240 Pa (5.0 psf).

**NOTE 5:** The default pressures used for water penetration resistance tests conducted in the field are not the same as the laboratory test pressure to allow for field conditions and test methods that vary from the laboratory test conditions and test methods. These conditions are primarily related to the ambient environmental conditions and the installation. The certified and labeled product performance is based on laboratory testing performed under controlled laboratory conditions. The temperature, wind and barometric pressure conditions during a field test will typically vary from the standard laboratory conditions.

The field installation conditions also influence the product performance. Products tested in the laboratory are

perfectly plumb, level and square in a precision opening. Field test specimens, although installed within acceptable industry tolerances, are rarely perfectly plumb, level and square. Shipping, handling, acts of subsequent trades, aging and other environmental conditions all may have an adverse effect upon the performance of the installed specimen. A 1/3 reduction of the test pressure for field testing is specified as a reasonable adjustment for the differences between a laboratory test environment and a field test environment.

4.3.3 With all operable portions of the specimen closed and locked, the specimen shall be subjected to a water penetration test in accordance with ASTM E 1105 procedure “A” or “B” in accordance with Section 4.3. Procedure “A” shall consist of a 15-minute test with continuous pressure and water application. When using procedure “B” each of the four cycles shall consist of five minutes with pressure applied and one minute with the pressure released during which the water spray is continuously applied. Observe and note all points of water penetration, if any, that occur during the test. If the origin of the water leakage cannot be definitively attributed to either the fenestration product specimen or the joint between the fenestration product specimen and the surrounding condition, a forensic evaluation shall be performed using the procedures outlined in AAMA 511 while maintaining the test pressures defined in the field testing specifications, and employing the test methods defined in AAMA 502.

4.3.4 Water penetration attributable to the surrounding condition shall be defined as the presence of uncontrolled water which did not originate from the fenestration product or the joint between the fenestration product specimen and the wall/roof. Water penetration attributable to the fenestration product specimen shall be defined as the penetration of uncontrolled water beyond a plane parallel to

the innermost edges of the product and that indisputably originates from the fenestration product. Water penetration attributable to the perimeter joint shall be defined as uncontrolled water that indisputably originates at the joint (see Figure 1).

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## 5.0 TEST REPORTS

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**5.1** The report shall include enough information to reproduce the test. The following information shall be included, at a minimum:

### 5.1.1 General

The testing agency, name of the individual(s) performing the tests, date and time of test, date of report, identification and location of the building shall be identified. The date of the last equipment calibration and the location of calibration records shall be included in the report.

### 5.1.2 Fenestration Product Description

The manufacturer, model, operation type, dimensions, materials, etc; identification and location of specimen(s) within the building; physical condition of specimen; description of any modifications made to the specimen; number of retests, etc. The test agency shall report the plumb, level and square condition of the tested specimen.

### 5.1.3 Sampling Procedures

If applicable, describe or list the procedures established from Section 3.0.

### 5.1.4 Test Parameters

List or describe the specified cyclic and/or static pressure differential(s) used in the test, whether the chamber was affixed to the interior or exterior of the wall/roof, and provide a detailed description (to include sketches showing location, if appropriate) of the chamber attachment to the specimen. Provide a written description of any measures that were taken to control ambient conditions. Clearly identify any elements of the specimen that were not tested. Verify in a statement that the sample was inspected immediately prior to the test or installation of the chamber if it conceals portions of the window, that the original conditions were observed and documented, and that all surfaces were dry, such that water observed during or after testing was produced by the test itself and no other possible source.

### 5.1.5 Test Results

Record the following:

- Actual and allowable air leakage for the window or door.
- Actual water penetration for the window or door.
- Actual water penetration for the perimeter condition.
- Environmental conditions as measured at the time of the test: wind, speed, wind direction, precipitation, barometric pressure and ambient temperature.

### 5.1.6 Compliance Statement

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

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## 6.0 REFERENCED DOCUMENTS

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

### 6.2 American Architectural Manufacturers Association (AAMA)

**AAMA/WDMA/CSA 101/LS.2/A440-05**, Standard Specification for Windows, Doors, and Unit Skylights

**AAMA/WDMA/CSA 101/LS.2/A440-08**, North American Fenestration Standard/Specification for windows, doors, and skylights

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

**AAMA 511-08**, Voluntary Guideline for Forensic Water Penetration Testing of Fenestration Products

### 6.3 ASTM International (ASTM)

**ASTM E 122-07**, Standard Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

**ASTM E 783-02**, Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors

**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

**ASTM E 2128-01a**, Standard Guide for Evaluating Water Leakage of Building Walls



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## **Changes from AAMA 502-02 to AAMA 502-08**

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- Various editorial changes were made
- Added “Specifier Notes” to the “Short Form Specification”
- Added reference to 101/I.S. 2/A440 in Section 1.1 and throughout the document
- Added that “establishes the requirements for their installation during construction, prior to issuance of the building occupancy permit but no later than six months after installation” to Section 1.1
- Added reference to forensic testing in AAMA 511 and ASTM E 2128 in Section 1.1
- Revised Figure 1
- Added new Section 2.2, Test Chamber Arrangement
- Removed Figures 2a, 2b, 2c and 3
- Added a new “Note 1”
- Added “roof” to the previous “wall system”
- Added need for three test specimens for field testing (deleted a minimum of 100 products) in “Note 2”
- Added new information regarding water leakage in Section 2.2.2.3
- Added that advance notice of one week (minimum) shall be required for testing to Section 3.4.1
- Added new Section 3.5.3
- Deleted old Sections 4.2 and 4.3
- Added new Section 4.2.1
- Deleted notes in Section 4.2.2
- Added new Section 4.3 (including all sub-sections and notes)
- Deleted Sections 4.10 and 4.11



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