



Designation: **E2395–06 (Reapproved 2013) E2395 – 18**

# Standard Specification for Voluntary Security Performance of Window and Door Assemblies with and without Glazing Impact<sup>1</sup>

This standard is issued under the fixed designation E2395; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers ~~voluntary~~ performance requirements and methods of test for the resistance to forced entry of window and door assemblies. This specification addresses the capability of window and door assemblies to frustrate and potentially delay or deter opportunistic entry by unskilled and semi-skilled intruders. This specification does not address detention facilities or window and door assemblies attacked by professional, sophisticated intruders.

1.2 This specification is used for the testing of complete window and door assemblies including assault to the infill glazing. Direct assault to the infill glazing at the specified threat level is not included in other ASTM test methods that address fenestration security performance.

1.3 These requirements are limited to window and door assemblies only as manufactured, regardless of their materials or method of manufacture. They do not include requirements for secondary or storm windows and doors, doors intended for vehicular access, or skylights. This is a laboratory test, not a field test that simulates an installed condition.

~~1.3 This specification provides a uniform set of guidelines based upon currently available information and research. As new information and research becomes available it will be considered.~~

1.4 All values are stated in SI units and are to be regarded as standard. Values given in parentheses are for information only. Certain values contained in reference documents cited and quoted herein may be stated in inch-pound units and must be converted by the user.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate ~~safety~~ safety, health, and ~~health~~ environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[E631 Terminology of Building Constructions](#)

[E1886 Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile\(s\) and Exposed to Cyclic Pressure Differentials](#)

[E1996 Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes](#)

[E2025 Test Method for Evaluating Fenestration Components and Assemblies for Resistance to Impact Energies \(Withdrawn 2015\)](#)<sup>3</sup>

[F476 Test Methods for Security of Swinging Door Assemblies](#)

[F588 Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact](#)

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.51 on Performance of Windows, Doors, Skylights and Curtain Walls.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the ~~standard's~~ standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on www.astm.org.

F842 Test Methods for Measuring the Forced Entry Resistance of Sliding Door Assemblies, Excluding Glazing Impact

F1233 Test Method for Security Glazing Materials And Systems

2.2 AAMA Standards:<sup>4</sup>

~~ANSI/AAMA/WDMA 101/I.S. 2/NAFSAAMA/WDMA/CSA 101/I.S.2/A440 Voluntary Performance Specifications for Windows, Skylights, and Glass Doors~~ NAFS – North American Fenestration Standard/Specification for windows, doors, and skylights

AAMA 1304 Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems

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ASTM E2395-18

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<sup>4</sup> Available from American Architectural Manufacturers Association (AAMA), 1827 Walden Office Square, Suite 550, Schaumburg, Illinois, 60173-4268, <http://www.aamanet.org>.

3. Terminology

3.1 Definitions:

3.1.1 General terms used in this standard specification are defined in Terminology E631.

3.1.2 Terms common to this standard specification and Test Methods E2025, F476, F588, F842 and F1233 are defined in the respective document unless defined herein.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 door slab—a swinging door panel, blank, or leaf.

3.2.2 interlayer—a layer of material acting as an adhesive between plies of glazing, which adds additional performance to the finished product. For example: impact resistance, solar control, and acoustical insulation.

3.2.3 lite—a term for a single pane (or piece) of glass.

4. Performance Requirements

4.1 Products shall be tested to the following levels as described in Table 1.

5. Test Specimens

5.1 Window and Door Assemblies:

5.1.1 One test specimen for each product design seeking qualification shall be submitted.

TABLE 1 Assembly Performance Requirements

NOTE 1—Assemblies tested to the impact requirements of Specification E1996 for any missile level automatically qualifies any lesser missile level.

| Product Type                           | Performance Level | Performance Requirements  | Glazed Area Intrusion Test (Tested to 6.4)   |
|--|-------------------|---|--|
| Window Assemblies Tested to 6.1        | L4                | Minimum Performance Grade 10 per Annex A1 of Test Methods F588        | No   |
|  | L1                | Minimum Performance Grade 10 in accordance with Annex A1 of ASTM F588 | ASTM E1996 Missile A                         |
|  | L2                | Grade 10 per Annex A1 of Test Methods F588                            | Yes  |
|  | L2                | Grade 10 in accordance with Annex A1 of ASTM F588                     | ASTM E1996 Missile B                         |
|  | L3                | Grade 20 per Annex A1 of Test Methods F588                            | Yes  |
| Sliding Door Assemblies Tested to 6.2  | L3                | Grade 20 in accordance with Annex A1 of ASTM F588                     | ASTM E1996 Missile C                         |
|  | L4                | Grade 30 per Annex A1 of Test Methods F588                            | Yes  |
|  | L4                | Grade 30 in accordance with Annex A1 of ASTM F588                     | ASTM E1996 Missile C                         |
|  | L5                | Grade 40 per Annex A1 of Test Methods F588                            | Yes  |
|  | L5                | Grade 40 in accordance with Annex A1 of ASTM F588                     | ASTM E1996 Missile C plus ASTM F1233 Class 1 |
| Sliding Door Assemblies Tested to 6.2  | L4                | Minimum Performance Grade 10 per Annex A1 of Test Methods F842        | No   |
|  | L1                | Minimum Performance Grade 10 in accordance with Annex A1 of ASTM F842 | ASTM E1996 Missile A                         |
|  | L2                | Grade 10 per Annex A1 of Test Methods F842                            | Yes  |
|  | L2                | Grade 10 in accordance with Annex A1 of ASTM F842                     | ASTM E1996 Missile B                         |
|  | L3                | Grade 20 per Annex A1 of Test Methods F842                            | Yes  |
| Swinging Door Assemblies Tested to 6.3 | L3                | Grade 20 in accordance with Annex A1 of ASTM F842                     | ASTM E1996 Missile C                         |
|  | L4                | Grade 30 per Annex A1 of Test Methods F842                            | Yes  |
|  | L4                | Grade 30 in accordance with Annex A1 of ASTM F842                     | ASTM E1996 Missile C                         |
|  | L5                | Grade 40 per Annex A1 of Test Methods F842                            | Yes  |
|  | L5                | Grade 40 in accordance with Annex A1 of ASTM F842                     | ASTM E1996 Missile C plus ASTM F1233 Class 1 |
| Swinging Door Assemblies Tested to 6.3 | L4                | Minimum Performance Grade 10 per Annex A2                             | No   |
|  | L1                | Minimum Performance Grade 10 in accordance with ASTM F476             | ASTM E1996 Missile A<br>2g small missile     |
|  | L2                | Grade 10 per Annex A2   | Yes  |
|  | L2                | Grade 10 in accordance with ASTM F476                                 | ASTM E1996 Missile B                         |
|  | L3                | Grade 20 per Annex A2   | Yes  |
| Swinging Door Assemblies Tested to 6.3 | L3                | Grade 20 in accordance with ASTM F476                                 | ASTM E1996 Missile C                         |
|  | L4                | Grade 30 per Annex A2   | Yes  |
|  | L4                | Grade 30 in accordance with ASTM F476                                 | ASTM E1996 Missile C                         |
|  | L5                | Grade 40 per Annex A2   | Yes  |
|  | L5                | Grade 40 in accordance with ASTM F476                                 | ASTM E1996 Missile C plus ASTM F1233 Class 1 |

TABLE A2.1 Suggested Measured Performance<sup>A</sup>

| Load Identification | Grade 10         | Grade 20         | Grade 30         | Grade 40          |
|---------------------|------------------|------------------|------------------|-------------------|
| F <sub>T</sub>      | 5 min:           | 5 min:           | 5 min:           | 5 min:            |
| L <sub>1</sub>      | 1334 N (300 lbf) | 2224 N (500 lbf) | 3559 N (800 lbf) | 4893 N (1100 lbf) |
| L <sub>2</sub>      | 1334 N (300 lbf) | 2224 N (500 lbf) | 3559 N (800 lbf) | 4893 N (1100 lbf) |

<sup>A</sup> It is suggested that Table A2.1 be used with the understanding that four levels of load identification are established with load identification 40 being the highest and 10 being the lowest. Use of load identification should be selected in accordance with security objectives desired.

5.1.2 Window and door assemblies tested for conformance to this specification shall be complete specimens representative of those produced by the manufacturer or fabricator. (~~ANSI/AAMA/WDMA 101/I.S. 2/NAFSA (AAMA/WDMA/CSA 101/I.S.2/A440 contains reference sizes which may prove useful in coordinating with window and door performance requirements not included in this specification.)~~)

5.1.3 A test specimen shall be of the ~~largest~~ assembly size (~~outside to outside~~) for which ratings are sought.

5.1.4 A test specimen shall contain the entire panel, door slab or sash configurations, locking devices, hardware, interlocking details, meeting rail details, and glazing for which rating is sought.

5.1.5 The same test specimen shall be used for each test sequence required by this specification.

5.1.6 Windows or doors tested with more than one locking device shall not qualify windows or doors with fewer locking devices regardless of size.

~~5.2 Glazing Materials (for 6.5):~~

~~5.2.1 One test specimen for each glazing material type to be rated.~~

~~5.2.2 Glazing material test specimens shall be representative of those produced by the fabricator or manufacturer. The glazing shall contain identical materials and be of the same type, treatment and thickness for which qualification is sought.~~

~~5.2.3 Test specimens shall be mounted according to Section 7 of Test Method F1233.~~

~~5.2.4 The test specimen size shall be 600 mm (24 in.) by 600 mm (24 in.).~~

## 6. Test Methods

6.1 *Window Assemblies Forced Entry Test:*

6.1.1 Prepare the specimen as outlined in Section 9 of Test Methods F588.

6.1.2 *Hand Manipulation Test:*

6.1.2.1 Lift, push, pull or otherwise manipulate by hand the sash or panel relative to the clearances within the frame, while attempting to open the sash or panel.

6.1.2.2 This test shall be conducted continuously for five minutes.

6.1.3 Perform the tests using the desired level from Section 4 of this document according to specification in accordance with the procedure outlined in Section 10 of Test Methods F588.

6.2 *Sliding Door Assemblies Forced Entry Test:*

6.2.1 Prepare the specimen as outlined in Section 9 of Test Methods F842.

6.2.2 Perform Hand Manipulation Test in 6.1.2.

6.2.3 Perform the tests according to in accordance with the procedure outlined in Section 10 of Test Methods F842.

6.3 *Swinging Door Assemblies Forced Entry Test:*

6.3.1 Prepare and test the specimen as outlined in Annex A1.

6.4 *Assembly Glazed Area Intrusion Test:*

6.4.1 Conduct a missile impact test using Test Method E1886 with no air pressure cycling.

6.4.2 The missile shall be a 1700 ( $\pm 100$ ) g (3.75  $\pm$  0.25 lb) two-by-four traveling at 15 m/s (50 f/s).

6.4.1 Impact the specimen twice. The exception to this second impact is if both dimensions of the glazing are less than 420 mm (17 in.), in which case there is only one impact with no air pressure cycling.

6.4.1.1 The missile size shall be as specified in Table 1.

6.4.1.2 Impact the specimen twice. The exception to this second impact is if both dimensions of the glazing are less than 420 mm (17 in.), in which case there is only one center impact.

6.4.1.3 The first impact shall be within a 65 mm (2.5 in.) radius circle located at the center of the glazing.

6.4.1.4 The second impact shall be within a 65 mm (2.5 in.) radius circle with the center located within 150 mm (6 in.) of a corner.

6.4.2 For performance level L5 products, conduct manual forced entry testing after missile impact in accordance with 9.2 of Test Method F1233 using Class I Sequence specified in Table 2.

6.4.2.1 The required ten impacts shall be entirely within a 150 mm (6 in.) radius circle having its center located 150 mm (6 in.) from an edge and from the missile impact point (Fig. 1).

6.5 *Glazing Material Qualification Test:*

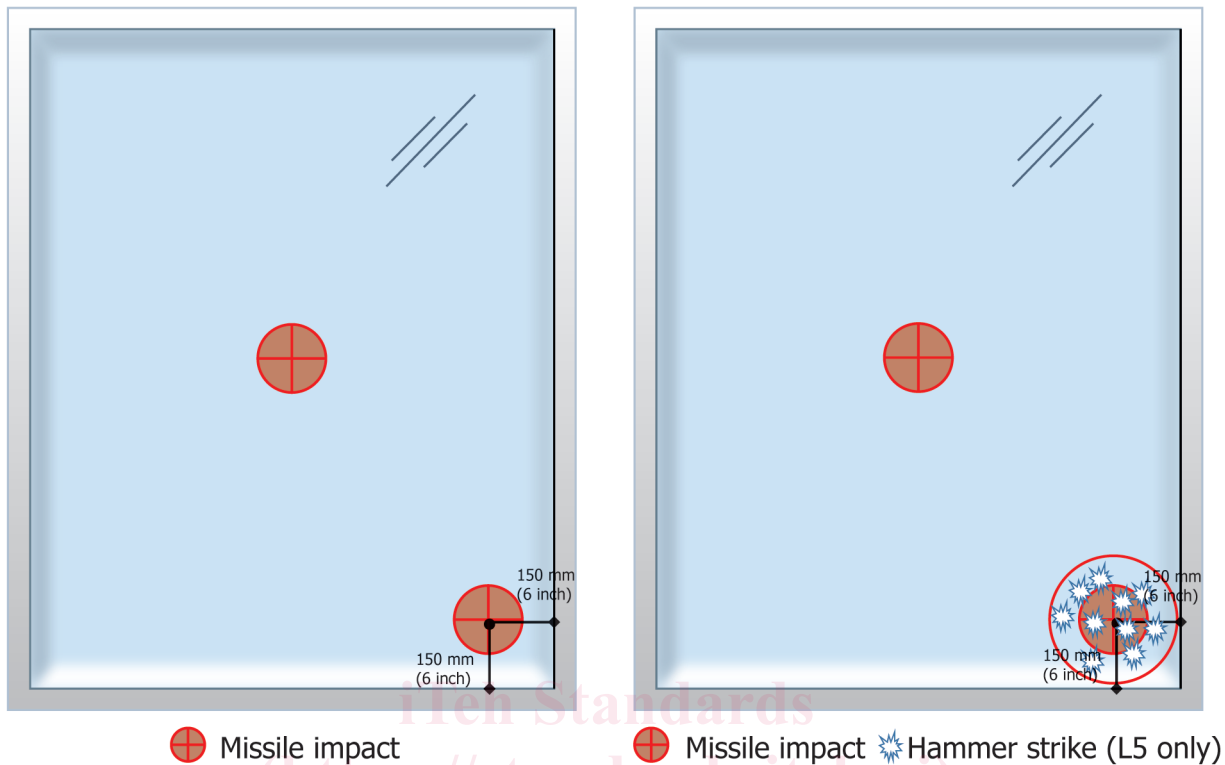
6.5.1 Perform Forced Entry Testing as outlined in Section 9.2 of Test Method F1233 ~~using Class I Sequence specified in Table 2:~~

6.5.1.1 The required ten impacts shall be entirely within a 150 mm (6 in.) radius circle having its center located 150 mm (6 in.) from an edge.

## 7. Pass/Fail Criteria

The following two sets of pass/fail criteria shall apply for this specification:

7.1 *Window Assemblies, Sliding Door Assemblies, or Swinging Door Assemblies:*



⊕ Missile impact      ⊕ Missile impact ✨ Hammer strike (L5 only)

FIG. 1 Example of Missile Impact and Hammer Strike Zone Locations

7.1.1 Any opening that is sufficient to freely pass a 75 Level 1–4 is met when no opening is formed through which a 76 mm (3 in.) diameter sphere with a horizontal solid sphere can pass through the specimen using a horizontally applied force of 18 N (4 lb) or less constitutes a failure. less. These criteria will apply when the free passage of the shape is made through a hole in any portion of the test specimen.

7.1.2 Level 5 is met when the test specimen resists the missile impacts, without missile penetration of the inner plane of the infill and then, shall pass 10.2.4.2 (Body Passage) of Test Method F1233 when tested in accordance with 6.4.2.

7.2 Glazing Materials:

7.2.1 Failure is defined in Section 9.2.4.2 (Body Passage) of Test Method F1233.

8. Product Qualification

8.1 Products shall be qualified as passing and shall be rated when the following conditions have been met:

8.1.1 Test specimens shall be tested following the appropriate test method (Window Assemblies, Sliding Door Assemblies, or Swinging Door Assemblies) in this specification and comply with the pass/fail criteria established in 7.1.

8.1.2 Glazing materials used in products shall be tested following the Glazing Materials Test and comply with the pass/fail criteria established in 7.2.

8.2 Substitutions shall be according to in accordance with the following criteria:criteria:

8.2.1 Successful tests of a window or door assembly shall qualify other assemblies with thicker or equal glazing and thicker or equal identical interlayer material formulation of interlayer or film materials of the same glass type and treatment, provided the glazing detail is unchanged:details are unchanged other than to accommodate any variations in overall glazing thickness.

8.2.1.1 Glazing detail changes shall demonstrate equivalent performance through a review of materials or by engineering analysis.

8.2.2 Products which have been tested and rated by this specification shall qualify identical assemblies that are smaller, provided the smaller assembly's dimensions shall not exceed dimension equal to or smaller than both the width and height of the test specimen's width or height:specimen.

8.2.3 Glazing materials which contain tinting or reflective coatings are considered equivalent to the same thickness as clear materials (or vice-versa), provided the tinting or coatings are integral to the monolithic glass and are not applied films. Heat-treated

~~glazing material colors may be changed provided the glazing construction remains unchanged. Heat-treated glass shall not qualify annealed glazing material, glass material, and FT shall not qualify HS or AN.~~

8.2.4 Successful tests of a window or door assembly that contains single lite glazing (monolithic or laminated) shall qualify multiple lite glazing (insulating) units provided the requirements of 8.2.1 and 8.2.2 are satisfied.

8.2.5 Successful tests of a window or door assembly that contains construction to improve thermal efficiency of the frame or sash, shall qualify other assemblies that do not contain construction to improve thermal efficiency provided the same extrusions are used and the requirements of 8.2.1 and 8.2.2 are satisfied.

8.2.6 ~~When composite window or door assemblies, which include combinations of two or more window or door styles, assemblies are evaluated for conformance with this specification, each separate style product type of the composite window unit assembly shall be tested as though it were an individual window or door separately.~~

8.2.6.1 ~~Manufactured assemblies~~ Assemblies successfully tested can be combined provided the structural supports and connections between assemblies have been designed for ~~the all other~~ required loads.

8.2.7 ~~Different product types can be combined into a combination assembly provided the structural supports and connections between assemblies have been designed for the required loads.~~

8.2.8 Substitution of glazing material components or manufacturers (such as sealant, laminated glass interlayer, films, or plastics) is not permitted.

## 9. Compliance Statement

9.1 Report the following information:

9.1.1 ~~Window Assemblies~~, Assemblies:

9.1.1.1 Detailed description of the required test specimen(s) and report test results using the requirements of the Report section of Test Methods **F588**.

9.1.1.2 Detailed description of glazing materials including glass type, glass treatment, glass thickness, and component manufacturers and report indicating test results in accordance with the test requirements of ~~6.4 and 6.5~~.

9.1.1.3 State the ~~grade~~-level that was successfully achieved.

9.1.2 ~~Sliding Door Assemblies~~:

9.1.2.1 Detailed description of the required test specimen(s) and report test results using the requirements of the Report section of Test Methods **F842**.

9.1.2.2 Detailed description of glazing materials including glass type, glass treatment, glass thickness, and component manufacturers and report indicating test results in accordance with the test requirements of ~~6.4 and 6.5~~.

9.1.2.3 State the ~~grade~~-level that was successfully achieved.

9.1.3 ~~Swinging Door Assemblies~~:

9.1.3.1 Detailed description of the required test specimen(s) and report test results using the requirements of Section 11 of Test Methods **F842**.

9.1.3.2 Detailed description of glazing materials including glass type, glass treatment, glass thickness and component manufacturers and report indicating test results in accordance with the test requirements of ~~6.4 and 6.5~~.

9.1.3.3 State the ~~grade~~-level that was successfully achieved.

## 10. Keywords

10.1 forced entry; glass; glazing; impact; security; security doors; security windows; side hinged exterior doors; sliding door assemblies; sliding doors; sliding glass door assemblies; sliding glass doors; swing doors; swinging door assemblies; swinging doors; window assemblies; windows

## ANNEXES

(Mandatory Information)

### **A1. SWING DOOR ASSEMBLIES FORCED ENTRY TEST**

#### **A1.1 Preparation**

A1.1.1 Mount the swinging door test specimen into a 38 by 100 or 38 by 150 mm (nominal 2 by 4 or 2 by ~~6~~6 in.) lumber surround frame, in accordance with the manufacturer's written installation instructions.

A1.1.2 Install the mounted swinging door assembly specimen into the test frame, rigidly supporting the mounting frame to resist all loads stipulated for the panel arrangement to be tested.