Designation: E2395 – 06 (Reapproved 2013)

Standard Specification for Voluntary Security Performance of Window and Door Assemblies with and without Glazing Impact[1]

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 (ε) 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 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 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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

E2025 Test Method for Evaluating Fenestration Components and Assemblies for Resistance to Impact Energies

F476 Test Methods for Security of Swinging Door Assemblies (Withdrawn 2011)[3]

F588 Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact

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:*[4]

ANSI/AAMA/WDMA 101/I.S. 2/NAFS Voluntary Performance Specifications for Windows, Skylights, and Glass Doors

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 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.

[1] 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.

Current edition approved Oct. 1, 2013. Published December 2013. Originally approved in 2005. Last previous edition approved in 2006 as E2395 – 06. DOI: 10.1520/E2395-06R13.

[2] 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 Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

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

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.

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/NAFS 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 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 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 (±100) g (3.75 ± 0.25 lb) two-by-four traveling at 15 m/s (50 f/s).

6.4.3 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.

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

6.4.3.2 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.

6.5 *Glazing Material Qualification Test:*

TABLE 1 Assembly Performance Requirements

Product Type	Performance Level	Performance Requirements	Glazed Area Intrusion Test (Tested to 6.4)
Window Assemblies Tested to 6.1	L1	Minimum Performance Grade 10 per Annex A1 of Test Methods F588	No
	L2	Grade 10 per Annex A1 of Test Methods F588	Yes
	L3	Grade 20 per Annex A1 of Test Methods F588	Yes
	L4	Grade 30 per Annex A1 of Test Methods F588	Yes
	L5	Grade 40 per Annex A1 of Test Methods F588	Yes
Sliding Door Assemblies Tested to 6.2	L1	Minimum Performance Grade 10 per Annex A1 of Test Methods F842	No
	L2	Grade 10 per Annex A1 of Test Methods F842	Yes
	L3	Grade 20 per Annex A1 of Test Methods F842	Yes
	L4	Grade 30 per Annex A1 of Test Methods F842	Yes
	L5	Grade 40 per Annex A1 of Test Methods F842	Yes
Swinging Door Assemblies Tested to 6.3	L1	Minimum Performance Grade 10 per Annex A2	No
	L2	Grade 10 per Annex A2	Yes
	L3	Grade 20 per Annex A2	Yes
	L4	Grade 30 per Annex A2	Yes
	L5	Grade 40 per Annex A2	Yes

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:*

7.1.1 Any opening that is sufficient to freely pass a 75 mm (3 in.) diameter sphere with a horizontal force of 18 N (4 lb) or less constitutes a failure. These criteria will apply when the free passage of the shape is made through a hole in any portion of the test specimen.

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 the following 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 of the same glass type and treatment, provided the glazing detail is unchanged.

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 dimensions of the test specimen's width or height.

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

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, are evaluated for conformance with this specification, each separate style type of the composite window unit shall be tested as though it were an individual window or door.

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

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

9. Compliance Statement

9.1 Report the following information:

9.1.1 *Window 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; 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) 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.

A1.1.3 Open, close, and lock the swinging door test specimen a minimum of five times.

A1.1.4 Without damaging the door test specimen, remove from the swinging door, all screws, glazing beads, and mechanical fasteners that can be removed readily from the exterior within a time limit of 5 min using the following tools:

A1.1.4.1 A spatula, putty knife or other non-cutting tool with a thin blade 0.6 ± 0.1 mm (0.024 ± 0.004 in.) thick, 20 ± 2 mm (0.78 ± 0.08 in.) wide, and 90 ± 10 mm (3.5 ± 0.4 in.) long.

A1.1.4.2 Any non-powered, straight or Phillips head screwdriver appropriate to the mechanical fastener with a maximum length of 150 mm (6 in.).

A1.1.4.3 A standard slot-type pliers with a 150 to 175 mm (6 to 7 in.) overall length

A1.2 Perform Hand Manipulation Test in 6.1.2.

A1.3 Lock Manipulation Test

A1.3.1 Examine the swinging door test specimen and determine a method of inserting the tools in A1.3.1.1 and A1.3.1.2 from the exterior so as to contact the locking device. Without damaging the swinging door test specimen, using one technician, attempt to gain entry by attempting to open the panel by hand and manipulating the locking device with these tools, in any combination. Conduct this test continuously for a time limit of (T_1).

A1.3.1.1 A spatula, putty knife or other non-cutting tool with a thin blade, 0.6 ± 0.1 mm (0.024 ± 0.004 in.) thick, 20 ± 2 mm (0.78 ± 0.08 in.) wide, and 90 ± 10 mm (3.5 ± 0.4 in.) long.

A1.3.1.2 A piece of Black Annealed 16 gage steel wire at least long enough to reach from the point of insertion to the locking device(s). The properties of Black Annealed 16 gage wire are described in Machinery's Handbook, 22nd Edition.[5] 16 gage wire refers to a wire diameter of 1.6 mm (0.0625 in).

A1.4 Static and Impact Loads on Door Slab and Locking Device Strength Resistance Tests

A1.4.1 *Test A1*—With the swinging panels in the test position, a concentrated load (L_1) shall be applied separately to each member incorporating a locking device, at a point on the member within 75 mm (3 in.) of the locking device, in a direction equal to the swing direction of the door that would tend to open the door.

A1.4.1.1 For assemblies containing a pair of door slabs, apply the load separately and simultaneously to both slabs within 75 mm (3 in.) of the locking device.

A1.4.2 *Test A2*—Repeat Test A1 (see A1.4.1) while, simultaneously, an additional concentrated load (L_2) is applied to the within 150 mm (6 in.) of a corner on the locking edge of each panel or slab member.

A1.4.3 *Test A3*—Impact each slab or panel using the procedures and requirements of Test Method E2025.

A1.4.3.1 The impactor shall be a lead cone with impacting end having a surface diameter of 150 mm (6 in.).

A1.4.3.2 Position the impactor in front of the exterior side of the sash and panel so that, at rest, its major axis is perpendicular to the glazing and its striking end just touches the surface of the glazing.

A1.4.3.3 Pull the impactor back, raising it to the height necessary to produce 407 J (300 ft lb) of force, and release it.

A1.4.3.4 Deliver two impacts within a 65 mm (2.5 in.) radius circle whose edge is within 75 mm (3 in.) of a locking device.

A1.4.3.5 Repeat A1.4.3 for all remaining sash, panels, or slabs in the assembly.

A1.4.4 Upon completion of Tests A1 through A3 (see A1.4.1 – A1.4.3) and with all loads removed, perform the Lock Manipulation Test (see A1.2).

[5] Available from Industrial Press, Inc., 32 Haviland Street, Unit 2C, South Norwalk, CT 06854, http://www.industrialpress.com.

A2. SUGGESTED MEASURED PERFORMANCE FOR SWINGING DOORS

TABLE A2.1 Suggested Measured Performance[A]

Load Identification	Grade 10	Grade 20	Grade 30	Grade 40
T_1	5 min.	5 min.	5 min.	5 min.
L_1	1334 N (300 lbf)	2224 N (500 lbf)	3559 N (800 lbf)	4893 N (1100 lbf)
L_2	1334 N (300 lbf)	2224 N (500 lbf)	3559 N (800 lbf)	4893 N (1100 lbf)

[A] 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.

APPENDIXES

(Nonmandatory Information)

X1. PERFORMANCE LEVELS

X1.1 The products evaluated by this specification are potentially subjected to a wide variety of forced entry threats. Therefore, it is appropriate to evaluate products at different levels appropriate with the anticipated threat. This specification presents five levels of performance evaluation. Level 1 is intended to evaluate for intruders who attempt to gain entry without assaulting the glazing. Level 2 includes an assault on the glazing and is intended to evaluate for intruders who attempt to gain entry by manipulating the frame, sash or lock, or penetrating the glazing. Levels 3 through 5 contain an assault on the glazing and progressively higher frame sash or lock manipulation levels.

X1.2 This specification does not address situations involving high crime areas or areas attacked by professional, sophisticated intruders. To protect against this type of crime, a multiple approach must be taken. This will often include alarm and other surveillance systems and specially designed doors, hardware, and impact resistant glazing materials, and, perhaps different test methods. Basically, this type of approach must be custom designed to meet the demands of the specific area or problem.

X2. GLAZING MATERIAL QUALIFICATION TEST

X2.1 There are a wide variety of impact resistant glazing materials available. They offer varying levels of performance. In addition, fabrication and processing methods can affect performance of identical materials. Therefore, a Glazing Material Qualification Test has been included to standardize glazing materials procurement. In addition, this provides a platform for evaluation of performance of candidate materials on an equivalent basis.

X2.2 The Glazing Materials Qualification Test provides for a test of glazing materials at an appropriate level without imposing an undue burden upon the frame or sash. Glazing materials must be tested at an appropriate impact level to provide a reasonable level of security resistance.

X3. EMERGENCY ESCAPE AND RECUE REQUIREMENTS

X3.1 Security glazing material is by the nature of its design and what it is supposed to accomplish, impact resistant. It is either shatter-proof or when shattered, it remains in the frame intact. In previous debates during the development of impact resistant glazing standards for hurricane protection (which uses similar glazing material), concern was expressed that it would impair egress and fire and rescue efforts. After consulting with fire and rescue agencies, which performed their own independent tests, this was found to not be a valid concern. These agencies had no reservations about the use of impact resistant glazing in windows and doors.

X3.2 Model building codes contain egress requirements for all occupancies. Typically this is accomplished by using windows and doors for egress from a fire and ingress for fire and rescue personnel. The codes require certain types of operable windows and doors and specify minimum opening sizes when the window or door is in the open position. In all cases, egress and ingress is accomplished by opening a window or door. The codes never require breaking or shattering the glazing material. Further, should it be necessary for fire and rescue personnel to remove glazing material for entry or smoke evacuation, this can be easily accomplished with standard fire

and rescue equipment.