



Designation: F1233 – 21

Standard Test Method for Security Glazing Materials And Systems¹

This standard is issued under the fixed designation F1233; 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 test method sets forth procedures whose purpose is limited to the evaluation of the resistance of security glazing materials and systems against the following threats:

- 1.1.1 *Ballistic Impact*,
- 1.1.2 *Blunt Tool Impacts*,
- 1.1.3 *Sharp Tool Impacts*,
- 1.1.4 *Thermal Stress*, and
- 1.1.5 *Chemical Deterioration*.

NOTE 1—Specifically exempted from this test method are the use of power (motor or engine-driven) tools or devices, explosives, military ordinance (excepting small arms) and tools, processes or devices requiring more than two persons to transport and operate.

1.2 The values stated in inch-pounds are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For a specific warning statement, see Warning in 10.1.1.6.

1.4 *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:²

- A36/A36M Specification for Carbon Structural Steel
- A53/A53M Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

¹ This test method is under the jurisdiction of Committee F12 on Security Systems and Equipment and is the direct responsibility of Subcommittee F12.10 on Systems Products and Services.

Current edition approved Oct. 15, 2021. Published November 2021. Originally approved in 1989. Last previous edition approved in 2019 as F1233 – 08 (2019). DOI: 10.1520/F1233-21.

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.

A574 Specification for Alloy Steel Socket-Head Cap Screws
F1029 Guide for Selection of Physical Security Measures for a Facility (Withdrawn 2004)³

2.2 Other Documents:

- Sporting Arms and Ammunition Manufacturer's Institute (SAAMI) — Ammunition⁴
- United States Military Ammunition Specifications — Ammunition⁵
- Federal Specification GGG-313U — Cold Chisel⁶
- American Iron and Steel Institute M-1020 — Structural Steel⁷
- UL 10BC — Fire Extinguisher⁸

3. Terminology

3.1 Definitions:

3.1.1 *test director, n*—individual identified by the independent testing laboratory as being responsible to complete the specified tests as required and to document the results.

4. Class

4.1 *Ballistic Class*—Ballistic tests and test results from this standard shall be classified by the following (see also Table 1):

4.1.1 *HG1 Handgun - Low*—Ammunition conforming to SAAMI specifications for caliber .38 Special, 158 grain (10.2 g), soft point, producing velocities of 875 (± 25) ft/s (266 (± 7) m/s) at 15 ft (4.5 m) from the muzzle.

4.1.2 *HG2 Handgun - Medium Soft Point*—Ammunition conforming to SAAMI specifications for caliber .357 Magnum, 158 grain (10.2 g), jacketed soft point, producing velocities of 1400 (± 50) ft/s (427 (± 15) m/s) at 15 ft (4.5 m) from the muzzle.

4.1.3 *HG3 Handgun - Medium Jacketed*—Ammunition conforming to SAAMI specifications for caliber 9 mm, 124 grain

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

⁴ Available from Sporting Arms and Ammunition Manufacturers' Association (SAAMI), Box 1075, Riverside, CT 06878. <http://www.saami.org>.

⁵ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS. <http://quicksearch.dla.mil>.

⁶ Available from General Services Adm., 7th and D Sts. SW, Washington, DC 20407. <https://www.gsa.gov>.

⁷ Available from American Iron and Steel (AIS), 25 Massachusetts Avenue, NW, Suite 800, Washington, DC 20001, <https://www.steel.org>.

⁸ Available from Underwriters Laboratories (UL), UL Headquarters, 333 Pfingsten Road, Northbrook, IL, 60062, <http://www.ul.com>.

TABLE 1 Ballistic Criteria

Class	Weapon Description	Caliber	Bullet Mass ^A /Type ^B	Velocity ^C , ft/s (m/s)	Minimum No. of Impacts ^D
HG1	Handgun - Low	.38 Special	158 gr (10.2 g), lead	850 to 900 (259 to 274)	3
HG2	Handgun - Medium, Soft Point	.357 Magnum	158 gr (10.2 g), JSP	1350 to 1450 (411 to 442)	3
HG3	Handgun - Medium, Jacketed	9 mm	124 gr (8.0 g), FMC	1200 to 1300 (365 to 396)	3
HG4	Handgun - High	.44 Magnum	240 gr (15.6 g), LGC	1400 to 1500 (427 to 442)	3
SMG	Submachine-gun	9 mm	124 gr (8.0 g), FMC	1350 to 1450 (411 to 442)	3
R1	Rifle - Light	.223 (5.56 mm)	55 gr (3.6 g), M193 Ball, FMC	3200 to 3300 (975–1006)	3
R2	Rifle - Heavy, Soft Point	.30-'06	180 gr (11.7 g), SP	2850 to 3000 (867 to 914)	3
R3	Rifle - Heavy, Jacketed	.308 Winchester (7.62 mm)	147 gr (9.5 g), M80 Ball, FMC	2700 to 2800 (823 to 853)	3
R4-AP	Rifle - Armor Piercing	.30-'06	166 gr (10.8 g), M2-AP	2715 to 2850 (828 to 867)	1
R5	Rifle - Jacketed	.50	709.5 gr (45.9 g) Ball, FMC	2760 to 2860 (841 to 867)	1
SH1 ^E	Shotgun - Buckshot	12 gage, 3 in. Magnum	00 buckshot, 15 pellets	1150 to 1250 (350 to 381)	1 ^F
SH2	Shotgun - Slug	12 gage	1 oz. (437.5 gr, 28.3 g) rifled slug	1600 to 1700 (487 to 518)	3

^A gr denotes grain as a unit of mass: 1 gr = 1.429 × 10⁻⁴ lb (0.0647981 g).

^B FMC = Full Metal Casing, JSP = Jacketed Soft Point, LGC = Lead Gas-Check, and SP = Soft Point.

^C Velocity measured at a distance of 10 ft (3 m) from the strike face of the sample. Muzzle of the barrel is positioned at a distance of 25 ft (7.6 m) from the strike face of the sample.

^D Minimum number of shots required on glazed features plus additional shots to examine other features of the assembly. Prior to testing the intended impact location(s) shall be marked in the approximate center of the target area. Where 3 impacts are specified, they are to be located at the corners of a 5 in. (127 mm) equilateral triangle. The minimum spacing between impact locations is 4 in. (102 mm).

^E This ammunition is to be used as an adjunct to the primary test to further evaluate the ability of designed assembly details to resist fragmentary threats.

^F The shot pattern of the pellets shall be such that they all impact within an 8 in. (203 mm) diameter circle at a distance of 25 ft (7.62 m) from the muzzle of the weapon.

(8.0 g), full metal casing, producing velocities of 1250 (±50) ft/s (381 (±15) m/s) at 15 ft (4.5 m) from the muzzle.

4.1.4 *HG4 Handgun - High*—Ammunition conforming to SAAMI specifications for caliber .44 Magnum, 240 grain, lead gas check producing velocities of 1450 (±50) ft/s (442 (±15) m/s) at 15 ft (4.5 m) from the muzzle.

4.1.5 *SMG Submachine Gun*—Ammunition conforming to SAAMI specifications for caliber 9 mm, 124 grain (8.0 g), full metal casing producing velocities of 1400 (±50) ft/s (427 (±15) m/s) at 15 ft (4.5 m) from the muzzle.

4.1.6 *R1 Rifle - Light*—Ammunition conforming to U.S. Military specifications for caliber .223 (5.56 mm) NATO, M193 ball producing velocities of 3250 (±50) ft/s (991 (±15) m/s) at 15 ft (4.5 m) from the muzzle.

4.1.7 *R2 Rifle - Heavy Soft Point*—Ammunition conforming to SAAMI specifications for caliber .30-'06, 180 grain (11.7 g) soft point producing velocities of 2925 (±75) ft/s (991 (±15) m/s) at 15 ft (4.5 m) from the muzzle.

4.1.8 *R3 Rifle - Heavy Jacketed*—Ammunition conforming to SAAMI specifications for caliber .308 Winchester (7.62 mm), 147 grain (9.5 g), M80 Ball, full metal casing producing velocities of 2800 (±50) ft/s (853 (±15) m/s) at 15 ft (4.5 m) from the muzzle.

4.1.9 *R4-AP - Armor Piercing*—Ammunition conforming to U.S. Military specifications for caliber .30-'06, M2AP producing velocities of 2775 (±50) ft/s (846 (±15) m/s) at 15 ft (4.5 m) from the muzzle.

4.1.10 *R5 - Ball Jacketed*—Ammunition conforming to U.S. Military specifications for caliber .50 M2 Ball, full metal

casing producing velocities of 2810 (±50) ft/s (856 (±15) m/s) at 15 ft (4.5 m) from the muzzle.

4.1.11 *SH1 - Shotgun - Buckshot*—Ammunition conforming to SAAMI specifications for Shotshell 12-gage, 3 in. Magnum, 00 Buckshot producing velocities of 1315 (±50) ft/s (400 (±15) m/s) at 15 ft (4.5 m) from the muzzle.

NOTE 2—The 12-gage ballistic threat is to be used as a confirmatory test of assemblies. Glazing materials are not to be tested or rated against this threat.

4.1.12 *SH2 - Shotgun - Slug*—Ammunition conforming to SAAMI specifications for Shotshell 12-gage, 1 oz. (437.5 g) rifled slug producing velocities of 1650 (±50) ft/s (503 (±15) m/s) at 15 ft (4.5 m) from the muzzle.

4.2 *Forced Entry Class*—See [Table 2](#).

5. Summary of Test Method

5.1 Forced entry shall be determined by resistance of the glazing material or system to the following:

5.1.1 Ballistics attack only.

5.1.2 Physical attack only to include blunt tool impacts, sharp tool impacts, thermal stress, and chemical deterioration.

5.1.3 Ballistics attack followed by, and in combination with, physical attack.

6. Significance and Use

6.1 This test method is based on field experience rather than laboratory analysis. It provides a basis for the comparative evaluation of ballistic/forced entry/containment resistance of

TABLE 2 Forced Entry Sequence of Testing

Sequence	Test Implements	Impacts	Minutes	Amount	Class Achieved
1	Ball Peen Hammer	10			1.0
2	Ball Peen Hammer	10			1.1
3	1½-in. (4-cm) Diameter Pipe/Sledge	25			1.2
4	Extinguisher, CO ₂		1		1.3
5	Sledge Hammer	25			1.4
6	Propane Torch Flame		5 ^A		1.5
7	Ripping Bar	10			2.0
8	Ram	10			2.1
9	4-in. (10-cm) Diameter Pipe/Sledge	25			2.2
10	Sledge Hammer	25			2.3
11	Propane Torch Flame		5 ^B		2.4
12	Ripping Bar	10			2.5
13	Chisel/Hammer	25			2.6
14	Gasoline	4		½ Pint (¼ L)	2.7
15	Angle Iron/Sledge	25			2.8
16	Sledge Hammer	25			3.0
17	Ram	10			3.1
18	4-in. (10-cm) Diameter Pipe/Sledge	25			3.2
19	Sledge Hammer	25			3.3
20	Propane Torch Flame		5 ^B		3.4
21	Wood Splitting Maul	25			3.5
22	Sledge Hammer	25			3.6
23	Ripping Bar	10			3.7
24	Fire Axe	25			3.8
25	Chisel/Hammer	25			3.9
26	Acetone			½ Pint (¼ L)	3.10
27	Sledge Hammer	25			4.0
28	Ram	10			4.1
29	4-in. (10-cm) Diameter Pipe/Sledge	25			4.2
30	Sledge Hammer	25			4.3
31	Propane Torch Flame		5 ^B		4.4
32	Fire Axe	25			4.5
33	Sledge Hammer	25			4.6
34	Wood Splitting Maul	25			4.7
35	Chisel/Hammer	25			4.8
36	Sledge Hammer	25			4.9
37	Acetone			½ Pint (¼ L)	4.10
38	Fire Axe	25			4.11
39	Sledge Hammer	25			4.12
40	Chisel/Hammer	25			4.13
41	Wood Splitting Maul	25			5.0

^A For Class 1.5, the flame shall be extinguished with a fine mist of water immediately after the propane torch application.

^B For Classes 2.4, 3.4, and 4.4, if the sample continues to burn after removal of the flame (self-sustaining), it shall be allowed to burn an additional 10 min and then extinguished with a fine mist of water.

security glazings and systems and should not be used to establish or confirm the absolute prevention of forcible entries or forced exits. This test method defines three factors which determine the success or failure of any attempt to forcefully enter (or exit) the glazing or system. They are: (1) the tools employed, (2) the techniques and methods used by the attackers, and (3) the total time available to effect the entry or exit. This test method defines two of the three factors (tools and techniques) and allows the third (duration) to vary in order to establish levels of forced entry or exit resistance.

7. Apparatus (Ballistics)

7.1 *Ballistic Firing Devices*—Firearms or test barrels suitable for use with the following calibers of ammunition producing minimum velocities as required:

- 7.1.1 *.38 Special*, 158 grain (10.2 g), lead,
- 7.1.2 *.357 Magnum*, 158 grain (10.2 g), jacketed soft point,
- 7.1.3 *9 mm*, 124 grain (8.0 g), full metal casing,

- 7.1.4 *.44 Magnum*, 240 grain (15.6 g), lead gas check,
- 7.1.5 *.223 (5.56 mm, M193 Ball)*, 55 grain (3.6 g), full metal casing,
- 7.1.6 *.30-’06*, 180 grain (11.7 g), soft point,
- 7.1.7 *.308 Winchester (7.62 mm, M80 Ball)*, 147 grain (10.5 g), full metal casing,
- 7.1.8 *.30-’06*, 165 grain (10.6 g), M2-AP (armor piercing),
- 7.1.9 *.50 caliber, 710 grain (46 g), M2-FMC Ball*,
- 7.1.10 *12 gage, 3 in. Magnum*, 00 Buckshot, 15 pellets, and
- 7.1.11 *12 gage, 1 oz. (437.5 grain, 28.3 g), rifled slug.*

7.2 *Ammunition Class*—All ammunition used in conducting tests within this test method shall be manufactured in compliance with current configurations and standards established by the Sporting Arms and Ammunition Manufacturer’s Institute (SAAMI) or United States Military Specifications, as applicable, except as may be noted within this test method.

7.3 *Witness Material*: