UL 752

STANDARD FOR SAFETY

Bullet-Resisting Equipment

UL Standard for Safety for Bullet-Resisting Equipment, UL 752

Twelfth Edition, Dated October 17, 2023

Summary of Topics

This new Twelfth Edition of ANSI/UL 752 dated October 17, 2023 includes new ballistic testing requirements.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated October 14, 2022 and June 16, 2023.

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UL 752

Standard for Bullet-Resisting Equipment

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This ANSI/UL Standard for Safety consists of the Twelfth Edition.

The most recent designation of ANSI/UL 752 as an American National Standard (ANSI) occurred on October 17, 2023. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover materials, devices, and fixtures used to form bullet-resisting barriers which protect against robbery, holdup, or armed attack such as those by snipers.

1.2 This standard can also be used to determine the bullet resistance of building components that do not fit the definition of equipment, such as windows, walls, or barriers made out of bullet resistant materials.

1.3 This standard does not address personal protective equipment, such as body armor, helmets, and shields.

1.4 As used in these requirements, the term "bullet-resisting" signifies that protection is provided against complete penetration, passage of fragments of projectiles, or spalling (fragmentation) of the protective material to the degree that injury would not be caused to a person standing directly behind the bullet-resisting barrier.

1.5 These requirements also cover electrically-operated equipment, such as teller's fixtures using electrically-driven deal trays or package passers, and intercommunication or other electrical equipment that is an integral part of the bullet-resisting product.

1.6 The term "product" as used in this standard refers to all bullet-resisting equipment or any part thereof covered by this standard unless specifically noted otherwise.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component. See Annex A for a list of standards covering components generally used in the products covered by this standard.

2.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

2.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Referenced Publications

4.1 Any undated reference to a code or standard appearing in the requirements of this Standard shall be interpreted as referring to the latest edition of that code or standard.

4.2 The following publications are referenced in this Standard:

ASTM D396-97, Standard Specification for Fuel Oils

ASTM E3062, *Specification for Indoor Ballistic Test Ranges for Small Arms and Fragmentation Testing of Ballistic-resistant Items*

ASTM E3112, *Test Method for Ballistic-resistant Products and Shoot Packs*

ASTM E3062, *Specification for Indoor Ballistic Test Ranges for Small Arms and Fragmentation Testing of Ballistic-resistant Items*

MIL-STD-750F, *Test Methods for Semiconductor Devices*

MIL-STD-810G, *Test Method Standard for Environmental Engineering Considerations and Laboratory Tests*

NFPA 70, *National Electrical Code*

SAAMI Z299.2, *Sporting Arms and Ammunition Manufacturers' Institute*

UL 94, *Test for Flammability of Plastic Materials for Parts in Devices and Appliances*

UL 310, *Electrical Quick-Connect Terminals*

UL 486A-486B, *Wire Connectors*

UL 486E, *Equipment Wiring Terminals for Use With Aluminum and/or Copper Conductors*

UL 796, *Printed Wiring Boards*

UL 1059, *Terminal Blocks*

UL 1492, *Audio-Video Products and Accessories*

UL 2111, *Overheating Protection for Motors*

UL 1004-1, *Rotating Electrical Machines – General Requirements*

UL 746C, *Polymeric Materials – Use in Electrical Equipment Evaluations*

UL 969, *Marking and Labeling Systems*

5 Glossary

5.1 For the purpose of this standard the following definitions apply.

5.2 ELECTRICAL CIRCUITS:

a) High-Voltage (Class 1) – A circuit involving a potential of not more than 600 volts and having circuit characteristics in excess of those of a low-voltage, power-limited circuit.

b) Low-Voltage – A circuit involving a potential of not more than 30 volts AC, rms, 42.4 volts DC or AC peak.

c) Power-Limited – A circuit whose output is limited as specified in Power-Limited Circuits, Section 32.

d) Class 2 – A circuit in which the voltage and power limitations are in accordance with the requirements of Table 32.1 for AC circuits and Table 32.2 for DC circuits.

e) Class 3 – A circuit in which the voltage and power limitations are in accordance with the requirements of Table 32.1 for AC circuits and Table 32.2 for DC circuits.

5.3 LEVEL 1 – Protection against hand guns of medium power, such as the 9 mm, Super 38 Automatic, and the like, with muzzle energy of 380 – 460 foot-pounds (515 – 624 J).

5.4 LEVEL 2 – Protection against hand guns of high power, such as the .357 Magnum, and the like, with muzzle energy of 548 – 663 foot-pounds (743 – 899 J).

5.5 LEVEL 3 – Protection against hand guns of super power, such as the .44 Magnum, and the like, with muzzle energy of 971 – 1175 foot-pounds (1317 – 1593 J).

5.6 LEVEL 4 – Protection against high-power hunting and sporting rifles, such as the 30-06, and the like, with muzzle energy of 2580 – 3120 foot-pounds (3498 – 4929 J).

5.7 LEVEL 5 – Protection against military ball full metal copper jacket ammunition fired from a hunting rifle such as the 308 Winchester or a military rifle with muzzle energy of 2519 – 3048 foot-pounds (3416 – 4133 J).

5.8 LEVEL 6 – Protection against multiple shots from a submachine-gun, such as a 9 mm Uzi, and the like, with muzzle energy of 540 – 653 foot-pounds (732 – 885 J).

5.9 LEVEL 7 – Protection against multiple shots from a military assault rifle, such as an M-16, and the like, with muzzle energy of 1158 – 1402 foot-pounds (1570 – 1901 J).

5.10 LEVEL 8 – Protection against multiple shots from a military assault rifle, such as an M-14, and the like, with muzzle energy of 2519 – 3048 foot-pounds (3416 – 4133 J).

5.11 LEVEL 9 – Protection against armor piercing rounds fired from an M1 Garand rifle or the like, or high-power hunting and sporting rifles with muzzle energy of 2717 to 2777 foot-pounds (3683 – 4457 J). The bullet will be a .30-06 armor piercing round such as the US Military APM2.

5.12 LEVEL 10 – Protect against one shot from a military sniper rifle, such as the Barrett M82 A1 (XM 107), with a muzzle energy of 12,439 – 12.706 foot-pounds (16, 863 – 20,404 J). The bullet will be a .50 caliber round such as the US Military M2.

5.13 SUPPLEMENTARY SHOTGUN – A supplementary test using a rifled lead slug with a muzzle energy of 2438 – 2950 foot-pounds (3306 – 4000 J) and 00 lead buckshot with a muzzle energy of 2078 – 2415 foot-pounds (2818 – 3275 J), fired from a 12-gauge shotgun. Products shall be tested with both loads. Products complying with this test may have the suffix "-SG" added to the rating designation.

CONSTRUCTION – BULLET-RESISTING EQUIPMENT AND MATERIALS

6 Gunports

6.1 Gunports shall be constructed for operation from behind the barrier only. The gun door or shutter shall close automatically, and shall be guarded against being opened from the exposed side with a rubber suction cup or similar means.

6.2 Gunports shall be constructed so that a rod 5/8-inch (15.9 mm) in diameter will have a horizontal traverse of at least 90° and a vertical traverse of at least 30° below horizontal.

6.3 For Levels 1 – 3, a gunport shall not be rendered inoperative after being struck with one projectile. For Levels 4 – 10, and supplementary shotgun, a gunport may be rendered inoperative after being struck with one projectile, but shall remain closed (see Test Sample Requirements Assemblies, Section 14).

7 Speaking Apertures

7.1 Speaking apertures shall:

a) Fulfill their intended purpose;

b) Be bullet-resisting in accordance with 1.4; and

c) Prevent the insertion of the muzzle of any firearm including weapons as small as a 0.25 caliber handgun, in such a manner as to command direct aim on persons behind the protection.

8 Deal Trays and Package Passers

8.1 Deal trays and package passer devices shall not have openings or joints which will permit spray of projectile fragments to the interior as a result of firearm tests.

8.2 Deal trays and package passers shall be guarded against forcible entry from the exposed side using any of the methods specified for gunports.

8.3 Package passers shall be constructed such that money bags and the like can be passed without providing any opening through which the muzzle of any firearm, including weapons as small as a 0.25 caliber handgun, might be inserted to command the work space.

8.4 Deal trays shall be constructed so that when installed as intended they permit no direct line of fire toward the teller's position nor the insertion of the muzzle of any firearm, including weapons as small as a 0.25 caliber handgun, in such a manner as to command direct aim on persons behind the protection.

9 Intercommunication System

9.1 An electronic intercommunication system unit shall comply with UL 1492.

10 Barriers and Building Components

10.1 Barrier devices and building components that are intended to provide protection on their own or as part of an overall protective assembly between the public and the protected side may be fixed or moved into place when required.

10.2 Protection against a specified level of attack shall extend to a minimum of 78 inches (2 m) above the floor level on the public side.

10.3 In order to prevent an attacker from climbing or vaulting the barrier, throwing objects over the barrier, or aiming and firing a firearm directly or indirectly into the protected side, the construction described in 10.4 shall be provided from the minimum 78-inch (2-m) height to the ceiling.

10.4 The area from the 78-inch (2-m) height to a height of 10 feet (3.08 m) is to be provided with a minimum construction of wire mesh screening constructed of at least 0.053 inch (1.35 mm) minimum thickness expanded sheet steel or 10 AWG (0.102 inch diameter) (5.3 mm^2) steel wire with openings not greater than 2 inches (51 mm).

Exception: The construction described need not be provided to a height of 10 feet if the installation instructions specify that the top of the barrier is to be flush with part of the building structure.

PERFORMANCE – BULLET-RESISTING MATERIALS

11 Ballistic Designations and Ammunition Specifications

11.1 The UL 752 ballistic designations and ammunition specifications given in Table 11.1, Table 11.2, and Table 11.3 shall apply.

11.2 Ammunition shall meet the projectile specifications and tolerances provided in Annex B.

Table 11.1
Handgun Designations and Ammunition Specifications

Handgun (HG)				
Designation	**Ammunition**	**Weight**	**Reference velocity**	**Kinetic energy**
UL-HG-A	9 mm Luger FMJ RN	124 grains (8.0 grams)	1305 fps (398 m/s)	467.3 ft·lb (633.6 J)
UL-HG-B	.357 Mag JSP	158 grains (10.2 grams)	1430 fps (436 m/s)	715.1 ft·lb (969.5 J)
UL-HG-C	.44 MAG JHP	240 grains (15.6 grams)	1430 fps (436 m/s)	1093.6 ft·lb (1482.7 J)
UL-HG-D	9 mm Luger FMJ RN	124 grains (8.0 grams)	1470 fps (448 m/s)	592.1 ft·lb (802.8 J)
Note: There is no hierarchy of threat severity in this list.				

Table 11.2
Rifle Designations and Ammunition Specifications

Rifle (RF)				
Designation	**Ammunition**	**Weight**	**Reference velocity**	**Kinetic energy**
UL-RF-A	.30-06 Springfield JSP (7.62 x 63 mm)	180 grains (11.7 grams)	2700 fps (823 m/s)	2922.5 ft·lb (3962.4 J)
UL-RF-B	7.62 x 51 mm M80 Ball, NATO FMJ, Steel Jacket	149 +0/-3 grains (9.7 +0/-0.2 grams)	2780 fps (847 m/s)	2566.3 ft·lb (3479.4 J)
UL-RF-C	.243 Winchester, Pointed Soft Point (PSP)	100 grains (6.2 grams)	3000 fps (914 m/s)	1910.1 ft·lb (2589.7 J)

Table 11.2 Continued on Next Page

Table 11.2 Continued

Rifle (RF)				
Designation	**Ammunition**	**Weight**	**Reference velocity**	**Kinetic energy**
UL-RF-D	.270 Winchester, Pointed Soft Point (PSP)	130 grains (8.4 grams)	3100 fps (945 m/s)	2766.4 ft·lb (3750.7 J)
UL-RF-E	5.56 mm M193 FMJ BT, (5.56 x 45 mm)	56 +0/-2 grains (3.6 +0/-0.1 grams)	3390 fps (1033 m/s)	1416.7 ft·lb (1920.8 J)
UL-RF-F	5.56 mm M855 FMJ BT, (5.56 x 45 mm)	61.8 ±1.5 grains (4.0 ±0.1 grams)	3190 fps (972 m/s)	1393.7 ft·lb (1889.6 J)
UL-RF-G	7.62 x 39 mm Type 56, MSC FMJ, Copper-Plated Steel Jacket, Mild Steel Core Note: Surrogate round is under development.	124 +0/-2 grains (8.04 +0/-0.1 grams)	2480 fps (756 m/s)	1694.6 ft·lb (2297.8 J)
UL-RF-H	7.62 x 51 mm M80 Ball, NATO FMJ, Steel Jacket	149 +0/-3 grains (9.7 +0/-0.2 grams)	2780 fps (847 m/s)	2566.3 ft·lb (3479.4 J)
UL-RF-I	.30 caliber M2 AP FMJ, (7.62 x 63 mm)	165.7 +0/-7 grains (10.8 +0/-0.5 grams)	2880 fps (878 m/s)	3070.3 ft·lb (4162.8 J)
UL-RF-J	.50 caliber M33 FMJ Ball, mild steel core	660 grains (42.7 grams)	2910 fps (887 m/s)	12389.2 ft·lb (16797.5 J)
Note: There is no hierarchy of threat severity in this list.				

Table 11.3
Shotgun Designations and Ammunition Specifications

Rifle (RF)				
Designation	**Ammunition**	**Weight**	**Reference velocity**	**Kinetic energy**
UL-SG-A	Winchester, Ranger LE, 12 Ga., 2-3/4 Inch, 1 oz. Slug (Most common slug available)	437.5 grains (28.3 grams)	1200 fps (366 m/s)	1398.0 ft·lb (1895.5 J)
UL-SG-B	12-gauge 00 lead buckshot (12 pellets)	650 grains (42 grams)	1200 fps (366 m/s)	2074.8 ft·lb (2813.1 J)
Note: There is no hierarchy of threat severity in this list.				

11.3 During these tests the velocity of the projectile is to be recorded and shall be within ±30 ft/s (±9.1 m/s) of the specified velocity shown in Table 11.1, Table 11.2, and Table 11.3.

12 Test Sample Requirements: Bullet-Resisting Material

12.1 The applicable UL 752 ballistic designation(s) shall be declared for which the material will be tested.

12.2 A sufficient number of test samples fully representative of production products shall be provided.

NOTE: Spare test samples are recommended.

12.3 Each test sample of a material shall be 12 by 12 inches ±0.5 inches (305 by 305 mm ±12.7 mm). If test results indicate that a more severe condition would involve the testing of a larger size test sample, then the larger size sample up to the maximum overall size commercially produced shall be tested.

12.4 Each test sample shall be finished to the degree that there are no visible imperfections in the material, such as delaminations, air bubbles, and the like.

NOTE: UL 752 requires that test samples be fully representative of production products. If it is normal that minor flaws or fibers be present during production, then the manufacturer can submit such samples for testing.

12.5 Test samples shall be subjected to ballistic testing in accordance with Section 15.

12.6 Solid open-hearth steel not less than 3/16 inch (4.8 mm) thick, having an ultimate tensile strength of 50,000 psi (345 MPa), is acceptable for UL-HG-A designation and, therefore, is not required to be tested.

13 Test Sample Requirements: Bullet-Resisting Glazing Material

13.1 The applicable UL 752 ballistic designation(s) shall be declared for which the glazing material will be tested.

NOTE: Spare test samples are recommended.

13.2 Each test sample shall be 12 by 12 inches ±0.5 inches (305 by 305 mm ±12.7 mm). If bullet-resisting glass, plastic, or any combination thereof is produced with any lateral dimension smaller than test sample size, then the smallest section sample is also to be tested. If test results indicate that a more severe condition would involve the testing of a larger size test sample, then the larger size sample up to the maximum overall size commercially produced shall be tested.

13.3 Each assembly of bullet-resisting glazing material tested shall be finished to the degree that there are no visible imperfections in the materials, such as delaminations, air bubbles, and the like.

13.4 Test samples shall be subjected to ballistic testing in accordance with Section 15.

14 Test Sample Requirements: Assemblies

14.1 Bullet-resisting assemblies include gunports, deal trays, package passers, voice panels, door operating mechanisms, and the like.

14.2 A sufficient number of test samples fully representative of production products shall be provided and be in assemblies (including frames and glazing) that are representative of how those products are commonly built or applied.

NOTE: Spare test samples are recommended.

14.3 The applicable UL 752 ballistic designation(s) shall be declared for which the assembly will be tested.

14.4 The manufacturer shall provide a build sheet and dimensioned diagram indicating the location of potential weak points of an assembly. See 15.8.2 for examples of assembly weak points.

15 Ballistics Testing

15.1 Performance requirements

15.1.1 There shall be no complete penetration of the projectile through the test sample, and there shall be no spalling of material on the protected side of the test sample to the extent that fragments embed into or damage the witness panel.

15.1.2 Spalling of material from the protected side of the test sample is permitted for the 2-shot pattern (see 15.3.3) and for unsupported edge shots (see 15.3.5).

15.1.3 After the shot, there shall be no opening in the test sample greater than the projectile diameter.

15.2 Test range setup and requirements

15.2.1 The test range shall be set up in accordance with and meet the requirements of ASTM E3062.

15.2.2 Each test sample of a material shall be mounted in a rigidly fixed frame, (provided by the testing laboratory)., The frame shall and shall meet the following requirements:

a) The frame shall have two layers such that the test sample is sandwiched between the layers and restrained with mechanical or pneumatic clamping devices at each of the four corners of the frame.

b) The frame shall be aluminum or steel, approximately 0.20 inch (0.5 cm) thick.

c) The internal window of the frame shall be at least 9.0 by 9.0 inch (23.0 by 23.0 cm) square.

d) The frame shall be at least 1.4 inches (3.6 cm) wide, and the test sample shall extend to the outer edges of the frame.

15.2.3 Each test sample of an assembly shall be mounted in its intended use configuration and shall be rigidly held in place.

15.2.4 A witness panel shall be installed behind the test sample and shall meet the witness panel requirements specified in ASTM E3112,.

15.2.5 Each shot shall be fired singly for each test. For each shot the weapon is to be aimed, loaded with a single round and then fired.

15.3 Shot patterns

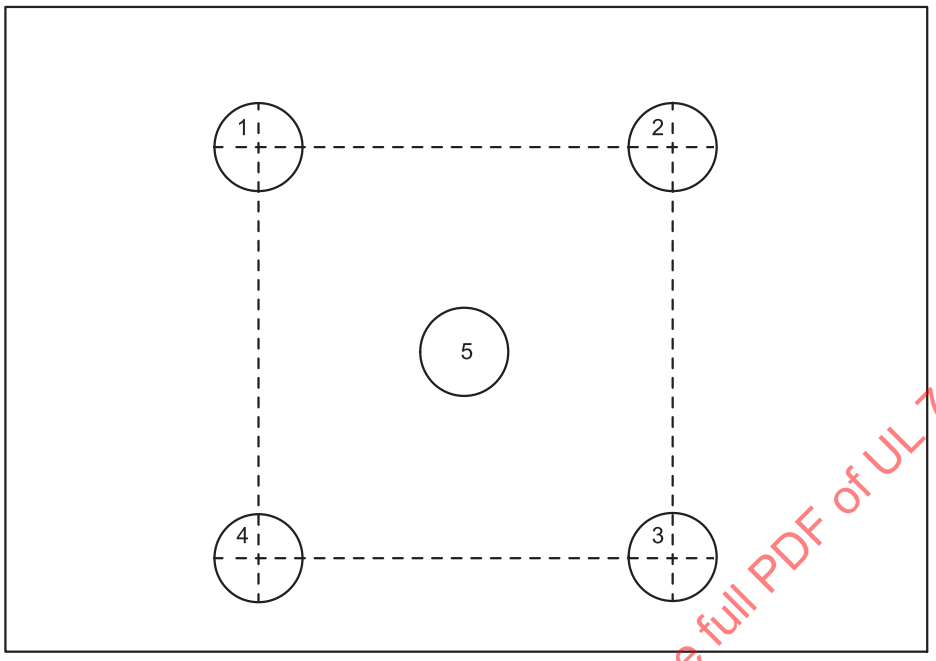
15.3.1 5-Shot pattern

15.3.1.1 Five shots shall be placed in the center of the test sample in a dice pattern, with shot order, as shown in Figure 15.1.

Exception: The placement of the shot pattern for samples of 15.8.2.2 shall be placed on the part of the assembly determined to be the weakest area. More than one location may be subjected to this test.

Figure 15.1

5-Shot Pattern



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15.3.1.2 The corner shots shall be spaced with 4.5 ±0.5 inches (114.0 ±12.7 mm) between impact centers.

15.3.1.3 The center shot shall be placed equidistant between other impact centers.

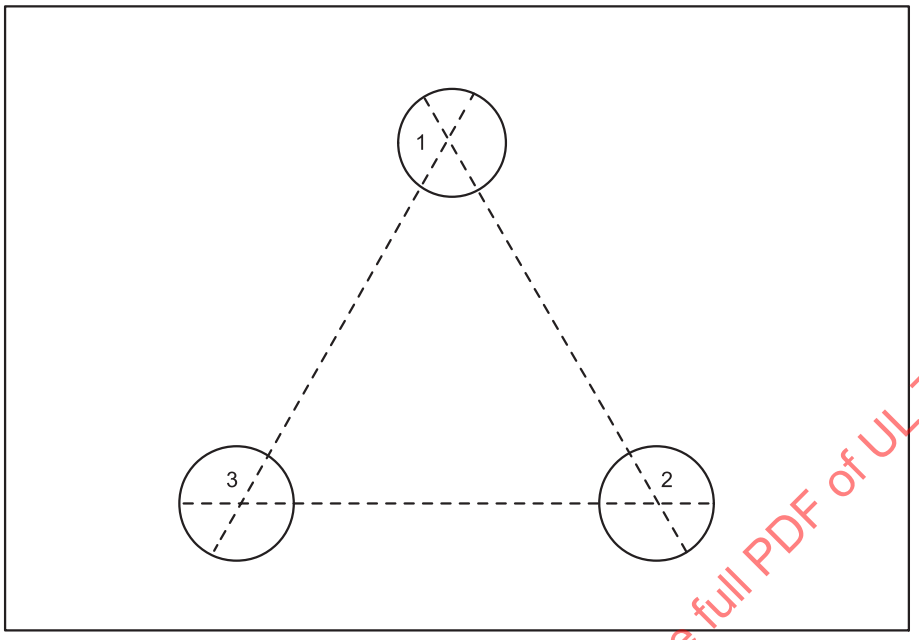
15.3.1.4 Each shot shall impact the test sample within 0.25 inches (6.0 mm) of the marked location.

15.3.2 3-Shot pattern

15.3.2.1 Three shots shall be placed in the center of the test sample in a triangle pattern, with shot order, as shown in Figure 15.2.

Figure 15.2

3-Shot Pattern



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15.3.2.2 The shots shall be spaced with 4.0 ±0.5 inches (102.0 ±12.7 mm) between impact centers.

15.3.2.3 Each shot shall impact the test sample within 0.25 inches (6.0 mm) of the marked location.

15.3.3 2-Shot pattern

15.3.3.1 Two shots shall be placed in the center of the test sample, with shot order, as shown in Figure 15.3.