Designation: F2322 – 12

Standard Test Methods for Physical Assault on Vertical Fixed Barriers for Detention and Correctional Facilities[1]

This standard is issued under the fixed designation F2322; 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 These test methods cover requirements for simulated service tests and testing equipment for determining the performance characteristics of walls designed to incarcerate inmates in detention and correctional institutions. The testing equipment provides for the setup and testing of two sample fixed barriers side-by-side, one with no openings and one equipped with a representative penetration in accordance with the American Correctional Association (ACA) standard for clear view area of 3 ft^2 (0.279 m^2), 12 in. (305 mm) wide by 36 in. (914 mm) high.

1.2 It is the intent of these test methods to help ensure that detention security walls perform at or above minimum acceptable levels to control passage of unauthorized or secure areas, to confine inmates, to delay and frustrate escape attempts, and to resist vandalism. It is recognized that in order to meet the intent of these test methods, opening assemblies within these walls must be compatible with the level of performance required by: Test Methods F1450, F1592, and F1643.

1.3 These test methods apply to walls enclosing or separating secure areas of detention/correctional facilities.

1.4 The values stated in inch-pound units are to be regarded as the standard. The SI values given in parentheses are approximate and for information only.

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]

F1450 Test Methods for Hollow Metal Swinging Door Assemblies for Detention and Correctional Facilities

F1592 Test Methods for Detention Hollow Metal Vision Systems

F1643 Test Methods for Detention Sliding Door Locking Device Assembly

F1915 Test Methods for Glazing for Detention Facilities

2.2 *UL Standard:*

UL-752 Bullet Resisting Equipment[3]

2.3 *ANSI Standard:*

ANSI/HMMA 863 Guide Specifications for Detention Security Hollow Metal Doors and Frames[4]

3. Terminology

3.1 *Definitions:*

3.1.1 *detention security*—assurance of the restriction of mobility of inmates to designated areas within a correctional or detention facility.

3.1.2 *forcible egress*—an opening created in the test wall which allows a 5 in. (127 mm) by 8 in. (203 mm) by 8 in. (203 mm) rigid rectangular box to be passed through it with no more than 10 lbf (44.5 N) of force.

3.1.3 *manufacturer*—the party responsible for the construction, fabrication, or supply of the test samples or components used to construct the test samples.

3.1.4 *performance characteristic*—the response of the wall in any one of the tests described herein.

3.1.5 *test completion*—conduct one test sequence for each wall.

3.1.6 *testing laboratory*—an independent third party materials testing laboratory.

[1] These test methods are under the jurisdiction of ASTM Committee F33 on Detention and Correctional Facilitiesand are the direct responsibility of Subcommittee F33.02 on Physical Barriers.

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[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] Available from Underwriters Laboratories (UL), Corporate Progress, 333 Pfingsten Rd., Northbrook, IL 60062.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

4. Significance and Use

4.1 A major concern for administrative officials is the security of barriers used in detention/correctional facilities. These test methods are designed to aid in identifying levels of physical security for walls which enclose or separate secure areas. This does not apply to the passage of contraband.

4.2 These test methods are not intended to provide a measure of resistance for a wall subjected to attack by corrosive agents, by high-powered rifles, explosives, sawing, or other such methods. These test methods are intended to evaluate the resistance of a wall to violent attacks by sustained manpower using battering devices, such as benches, bunks, or tables, and by handguns up to and including .44 magnum. Attacks from the outside and fire resistance ratings are not addressed in this standard.

4.3 The primary purpose or result of these test methods is to approximate the levels of abuse to which walls will potentially be subjected in the field. The desired result of its use is to help provide assurance of protection to the public, to facility administrative personnel, and to the inmates themselves.

4.4 It is recommended that detention/correctional facility administration provide adequate training, supervision, and preventative maintenance programs to enable walls to function as intended throughout the expected service life.

5. Sampling

5.1 Sample wall shall be constructed in accordance with 6.1.

5.2 Test reports shall include complete details of the test samples, details, photographs, or a combination thereof, of the testing apparatus and installation or construction instructions (see Section 9).

5.3 In the event of failure in one or more of the performance tests, the manufacturer shall provide another complete test sample or shall continue testing in another location on the wall, subject to the direction of the testing laboratory.

6. Specimen Preparation

6.1 *Construction:*

6.1.1 The construction of the test wall shall be representative of the wall as it will be placed in service.

6.1.2 Required results indicated in Table 1 are based upon a sample size of 8 ft (2438 mm) high by 8 ft (2438 mm) wide ± 4 in. (102 mm).

6.2 *Impact Test Fixture:*

TABLE 1 Security Grades and Impact Load Requirements

Grade No.	Number of Impacts[A]	Representative Barrier Duration Time (see X4.1)
1	600	60 min.
2	400	40 min.
3	200	20 min.
4	100	10 min.

[A] Number of impacts equally divided between blunt impactor (first sequence) and sharp impactor, applied in cyclic sequences of 50 impacts each.

6.2.1 The test wall support fixture shall simulate the rigidity normally provided to a wall in a building by the ceiling, floor, and adjoining walls (Figs. 1-4). The inclusion of load bearing conditions on the test wall is at the manufacturers' option.

6.2.2 The fixture is designed to accommodate two test samples; however, it is permissible to construct a test fixture that accommodates one sample only, if the manufacturer so chooses.

6.2.3 *Description of the Test Wall*—The test wall shall be constructed and mounted in a vertical wall test fixture and shall be supported as described in 6.2.1 throughout the testing procedure. The wall specification shall be included as part of the test report.

6.3 *Wall Construction or Mounting for Impact Testing:*

6.3.1 Construct or install the test walls as shown in Figs. 1-4. Position the impact test ram on the outside of the fixture in preparation to administer the series of impacts described in 7.2.

7. Procedures

7.1 *Bullet Penetration:*

7.1.1 *Scope*—This test is designed to evaluate the capability of a test wall to resist the ballistic attack of a .44 magnum (Level 3) handgun.

7.1.2 *Significance and Use*—This test is intended to simulate a field situation whereby one or more firearms are being used to attack a fixed barrier. The handgun is considered the most reasonably attainable firearm and the calibre, .44 magnum, is considered to be the most powerful that will potentially be reasonably attainable during a mass disturbance or riot within a detention or correctional facility.

7.1.3 When specified by the contract documents of a detention/correctional facility project, the wall samples for bullet penetration shall be tested in accordance with Standard UL-752. A representative sample based upon the wall construction under investigation shall be tested. Minimum size shall be 3 ft, 0 in. (914 mm) by 3 ft, 0 in. (914 mm).

7.1.4 The level of performance shall meet the rating .44 magnum, Level 3.

7.1.5 The pass/fail criteria shall be in accordance with Standard UL-752.

7.2 *Wall System Impact Test:*

7.2.1 *Scope*—This test method is designed to evaluate the capability of a complete test wall to resist repetitive impact forces at the designated critical areas.

7.2.2 *Significance and Use:*

7.2.2.1 This test method is intended to closely simulate a sustained battering ram style attack and provide an evaluation of the capability of the assembly to prevent, delay, and frustrate escape or access, or both, to unauthorized areas. The test shall be permitted to be used to aid in identifying a level of physical security for various configurations of walls.

7.2.2.2 An impact test of this design performed on a complete test wall evaluates the impact fatigue strength and the quality of construction and fabrication techniques as well as the strengths of materials used.

7.2.3 *Apparatus:*

7.2.3.1 The steel impact ram shall be equipped to be incorporated into a hinged or pivoted swinging pendulum

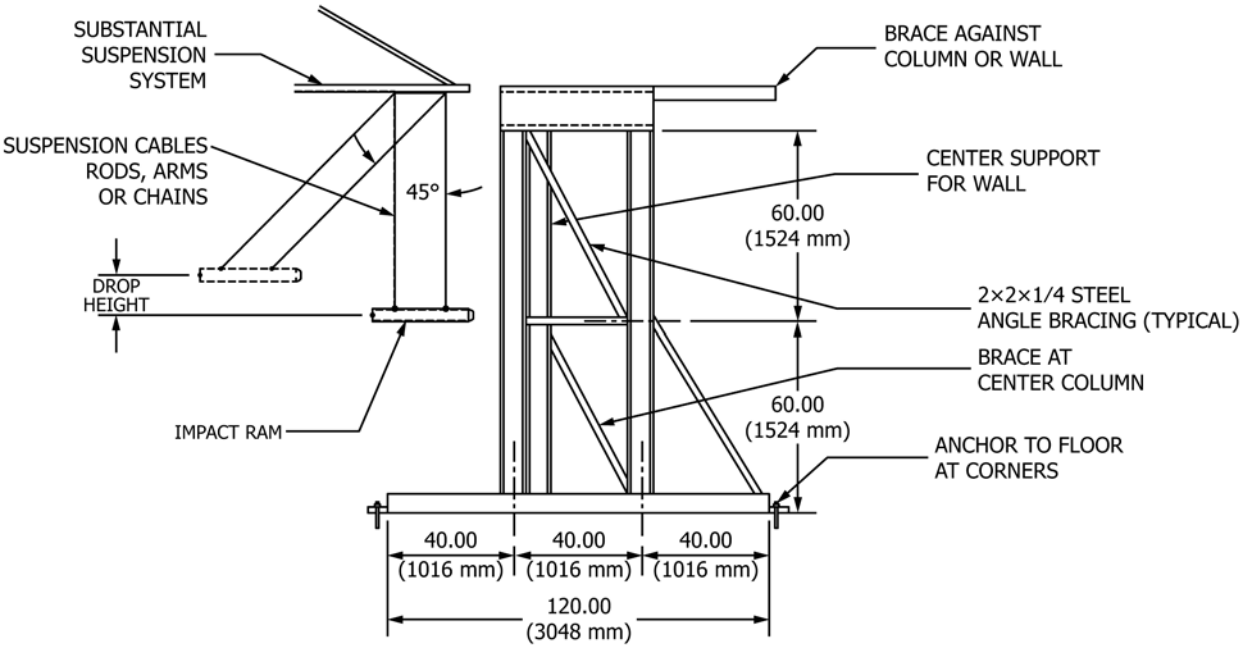


FIG. 1 Fixture and Test Wall Panels—Side View

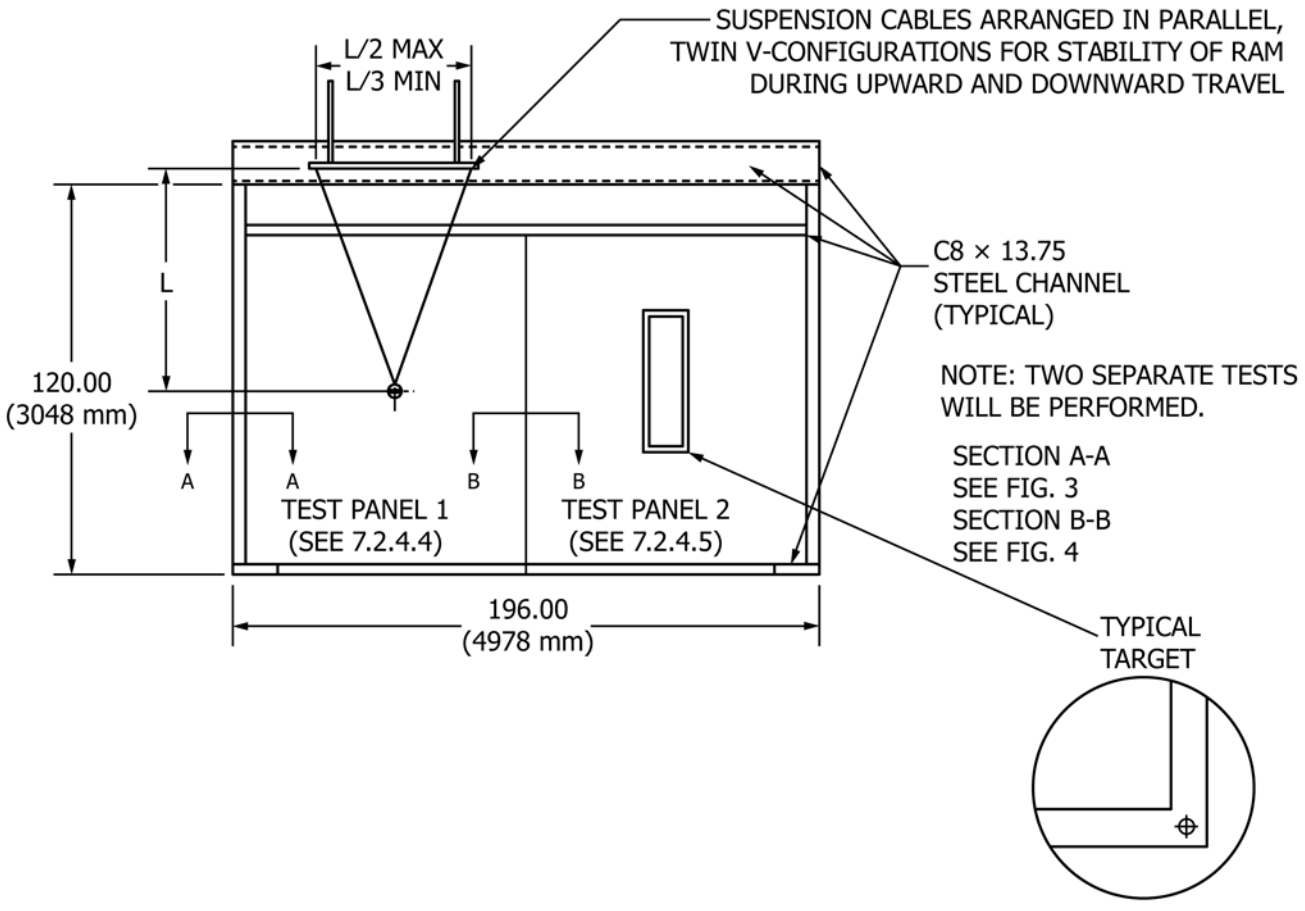


FIG. 2 Fixture and Test Wall Panels—Front View

system that is capable of delivering the required impact energy of 200 ft-lbf (271.2 J) to the test wall. The combined weight of the impact ram (Fig. 5) and either the blunt or the sharp impactor (see Figs. 6 and 7) shall be 80 lb (36.3 kg) ± 0.25 lb (0.10 kg). The drop height (Fig. 1) of the ram shall be 31 in. (762 mm) ± 1 in. (25.4 mm) to create the required impact

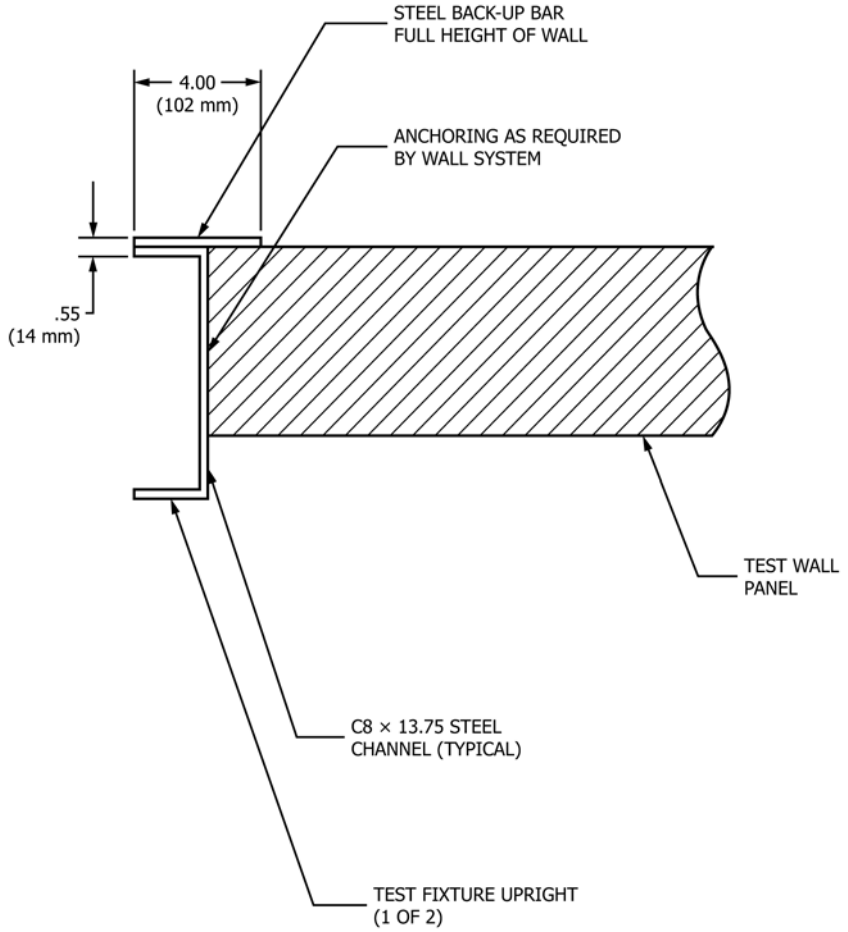


FIG. 3 Section A-A from Fig. 2

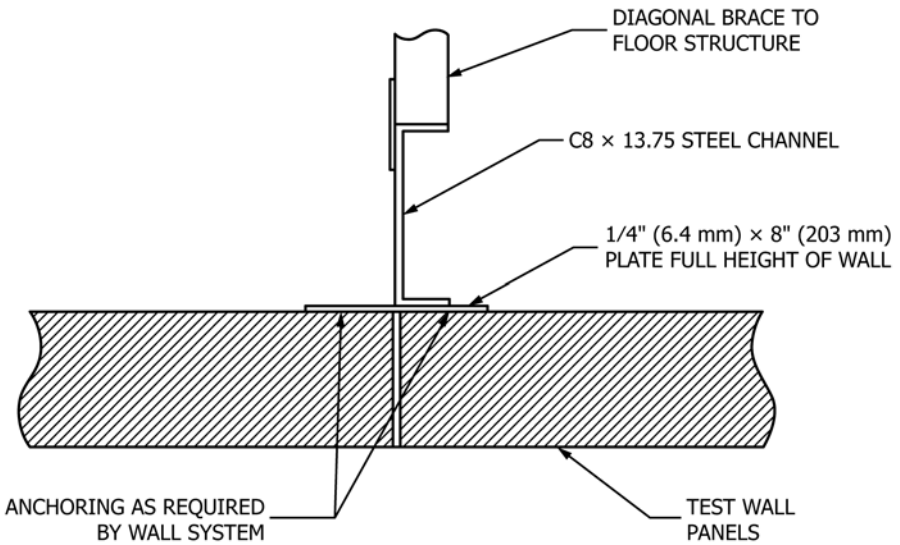
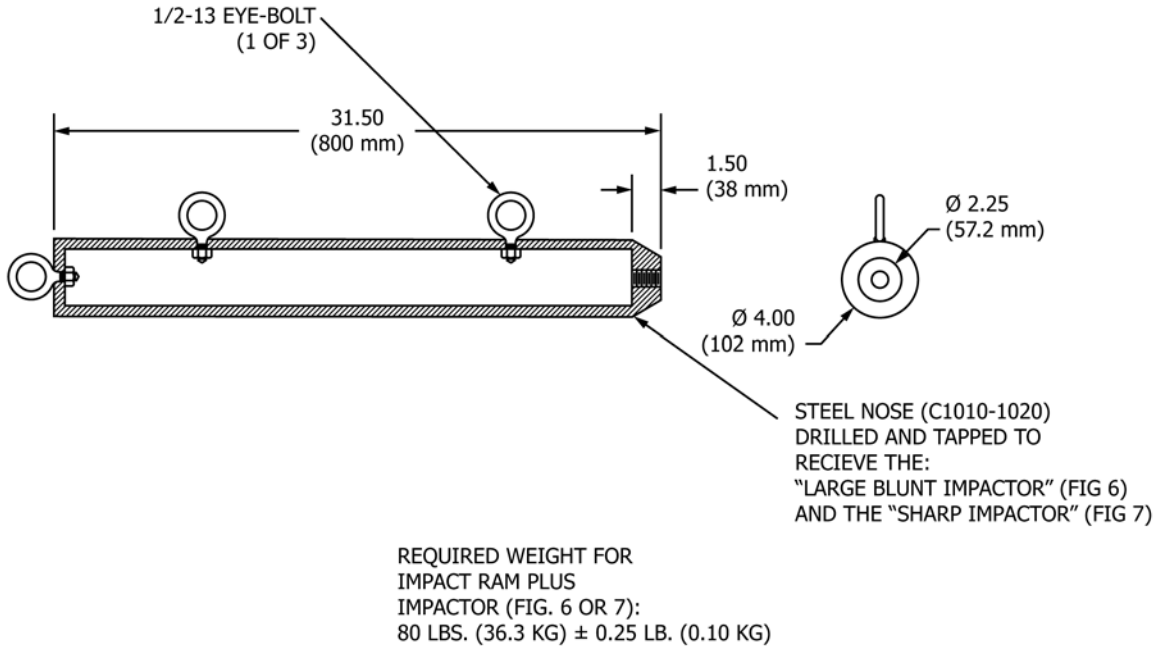


FIG. 4 Section B-B from Fig. 2

energy at the bottom of the arc and at the point of contact with the test wall. The angle of the suspension cables, rods, arm or chains shall be no greater than 45° off vertical when the ram is in the raised position. All pivot points in the suspension system must be in good repair and well lubricated to minimize friction losses that could reduce the impact energy being delivered to the test sample.



NOTE 1—To prevent shifting during test procedures, any material added inside or outside the ram to satisfy the weight requirement shall be rigidly attached.

FIG. 5 Steel Impact Ram

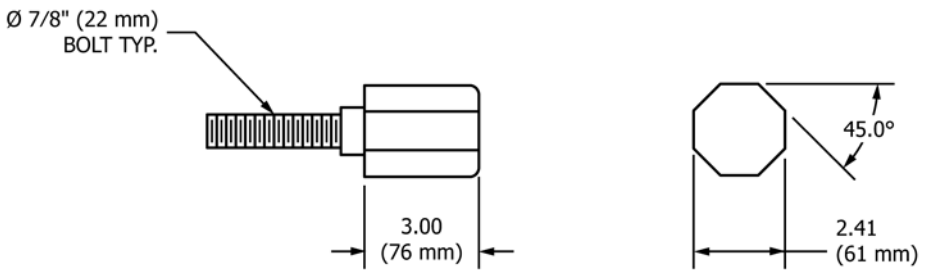


FIG. 6 Large Blunt Impactor

7.2.3.2 *Large Blunt Impactor*—The large blunt impactor shall be fabricated from C1010-C1020 carbon steel and shall be attachable to the steel impact ram in accordance with Fig. 6. The striking surface of the impactor shall have a surface area of 4 ± 0.04 in.^{2} (101.6 ± 1.02 mm^2) and shall have rounded edges similar to a 10 lb (4.54 kg) sledgehammer head.

7.2.3.3 *Sharp Impactor*—The sharp impactor shall be fabricated from C1010-C1020 carbon steel and shall be attachable to the steel impact ram in accordance with Fig. 7. The sharpness of the impact point shall be similar to the end of a new Fireman's axe at the beginning of the test sequence.

7.2.4 *Procedure:*

7.2.4.1 With the test fixture and test apparatus, deliver the series of impacts listed in Table 1 to the test wall.

7.2.4.2 Construct or mount two 8 ft (2438 mm) high by 8 ft (2438 mm) ± 4 in. (102 mm) wide test wall panels supported on all four sides in each half of the wall test fixture illustrated in Fig. 2. If the wall design requires control joints or seams, one will be included in the test wall for the purpose of testing.

7.2.4.3 Construct one of the wall panels with no openings and the other wall panel with a monolithic steel impact panel, acting as a simulated window, installed using anchoring techniques suitable to the wall construction and consistent with ANSI/HMMA-863. The clear opening size shall be: 12 in. (305 mm) wide by 36 in. (914 mm) high.

7.2.4.4 Apply the required number of impacts in accordance with Table 1 to the test panel #1. If there are no predicted weak points in the solid panel, apply the impacts to a target area to be selected by the test agent at the time of the test. If there are predicted weak points such as seams, unsupported edges, or other types of wall joints, apply the impacts at one of those locations. Repeatability of impact location during each series shall be ±2 in. (50 mm) horizontally and vertically from the designated impact target. Using the test apparatus in accordance with 7.2.3, begin the series of strikes against the selected target area of the test wall for the number of required impacts, first with the blunt impactor followed by the sharp impactor on the pendulum in cyclic sequences of 50 impacts each. The required impact energy for the blunt impactor is 200 ft-lbf (271.2 J) per impact and the required impact energy for the sharp impactor is 100 ft-lbf (135.6 J) per impact. During the test, reposition the pendulum as necessary to produce the maximum possible duress on the test wall, leading to wall failure. The time for repositioning and change of impact heads

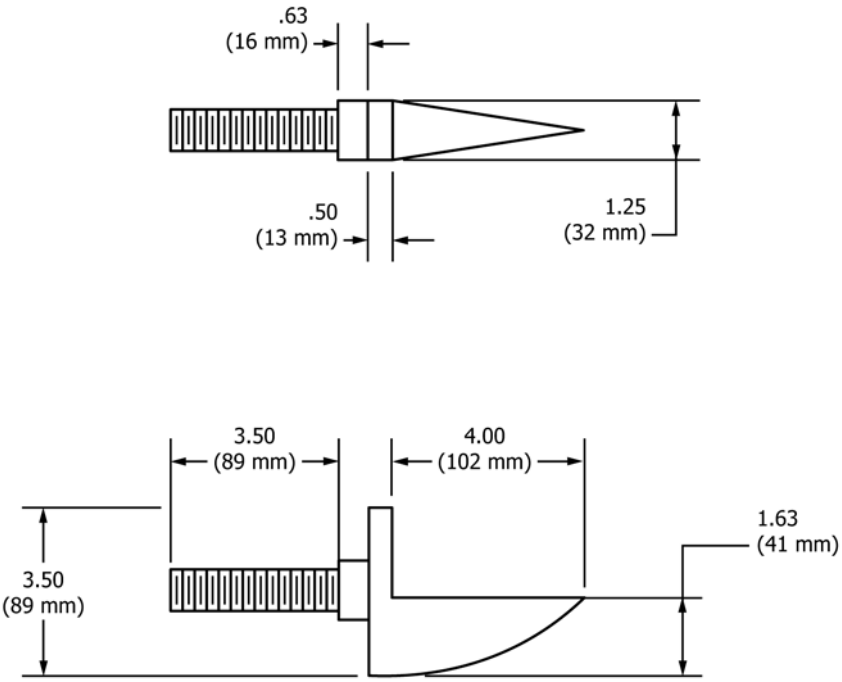


FIG. 7 Sharp Impactor

is not to be included in the test duration time. Record the number of strikes required to produce the first penetration of the panel, and the number of strikes required to produce an opening large enough to achieve forcible egress.

7.2.4.5 Apply the required number of impacts in accordance with Table 1 to the test panel #2, which is equipped with the impact panel. Apply the prescribed number of impacts at a corner of the impact panel. The corner to be tested shall be selected by the testing laboratory at the time of the test. Repeatability of impact location during each series shall be ±2 in. (50 mm) horizontally and vertically from the designated impact target. Using the test apparatus in accordance with 7.2.3, begin the series of strikes against the selected target area of the test wall for the number of required impacts, first with the blunt impactor followed by the sharp impactor on the pendulum in cyclic sequences of 50 impacts each. The required impact energy for the blunt impactor is 200 ft-lbf (271.2 J) per impact; and the required impact energy for the sharp impactor is 100 ft-lbf (135.6 J) per impact. During the test, reposition the pendulum as necessary to produce the maximum possible duress on the test wall, which is predicted to lead to wall failure. Record the number of strikes required to produce the first penetration of the wall, and the number of strikes required to produce an opening large enough to achieve forcible egress.

7.2.4.6 The wall must remain in place throughout the testing procedure. Failure is constituted by the wall being damaged to the extent that forcible egress can be achieved.

7.2.5 *Precision and Bias:*

7.2.5.1 The precision and bias of this test method for evaluating the impact fatigue strength of the wall cannot be determined until sufficient testing is done.

8. Certification

8.1 The manufacturer shall provide test reports by an independent testing laboratory which certify that the test walls were successfully tested in accordance with these test methods and which comply with Section 9.

9. Report

9.1 Report the following information:

9.1.1 Name and address of laboratory,

9.1.2 Date laboratory completed tests,

9.1.3 Name and address of wall manufacturer,

9.1.4 Description of identifying markings on the test wall,

9.1.5 Diagrams, details, and photographs of testing equipment,

9.1.6 Specifications and details of the test wall including drawings, wall specifications, and wall testing conditions such as load bearing conditions, and

9.1.7 All related test data, including resulting grade level achieved (Table 1).

9.2 Provide the following:

9.2.1 Video tape cassette recording of the entire test(s) from inception of the physical test to product failure or termination of the test.

9.2.2 Still color photographs of the salient stages of the test such as:

9.2.2.1 Initial penetration,

9.2.2.2 Conclusion of test, and

9.2.2.3 Each penetration which allows forcible egress shall be reported including photographs.

10. Precision and Bias

10.1 Precision and Bias evaluations have not been conducted for these test methods. When such data is available, a precision and bias section will be added.

11. Keywords

11.1 battering ram; correctional facility; detention facility; detention security; detention wall; door; escape; fire test (wall); frame; impact test (wall); lock; physical security; security wall

APPENDIXES

(Nonmandatory Information)

X1. APPLICATIONS AND REQUIREMENTS

X1.1 Examples of walls enclosing or separating the secure areas of detention and correctional facilities are those in day rooms, control rooms, cells, and sally ports.

X1.2 Security grade requirements shown in Table 1 are comparable to the security grade requirements described in the following related standards: Test Methods F1450, F1592, and F1915.

X2. TEST APPARATUS

X2.1 Test equipment suitable for use in evaluating the physical security of walls is described in this appendix. While certain commercial instruments are identified to adequately describe the test equipment, in no case does such identification imply recommendation or endorsement, nor does it imply that the material or equipment described is necessarily the best for the purpose.

X2.2 Figs. 1 and 2 show the fixtures and equipment necessary to carry out the test methods described in 7.2.

X2.3 Information on equipment necessary to perform the tests described in 7.1 and 7.2 is included in the referenced test methods.

X2.4 *Manufacturer's Procedure*—The manufacturer may elect to contract with the testing laboratory to provide the manufacturer with a certified procedure and security labeling service for the construction of tested assemblies with factory follow-up inspection service as an option.

X3. ATTACK WEAPONS

X3.1 These test methods address only those threats to vertical fixed barriers which would be anticipated based on the limited weapons, tools, and resources available to inmates within detention and correctional facilities. Where a fixed barrier is also accessible to external assault with weapons, tools, and resources available in the free world outside the facility, consider applying additional standards that address this type of assault.

X3.2 The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

X3.3 These test methods are subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

X4. REPRESENTATIVE BARRIER DURATION TIME

X4.1 The element of time is based upon historical testing observation that indicates that sustained manpower can deliver 400 blows of 200 ft-lbf (271.2 J) each in 45 min. The element of time assigned to the various grades of barriers is adjusted to achieve more manageable time periods than actual calculations provide. The amount of time is estimated and is offered solely as supplementary design information to assist the user in matching security grades with the attack resistance times and staff response times required for each barrier in the facility.