Designation: F1592 – 12

Standard Test Methods for Detention Hollow Metal Vision Systems[1]

This standard is issued under the fixed designation F1592; 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 fixed detention hollow metal vision systems of various materials and types of construction. These fixed hollow metal vision systems are used in wall openings in detention and correctional institutions designed to incarcerate inmates.

1.2 Frame assemblies investigated under these test methods include individual components including detention security hollow metal frames, frame anchoring, security glazing, panels, and removable glazing stops.

1.3 These test methods are designed to test the capability of a fixed detention hollow metal vision system to prevent, delay, and frustrate escape; to limit or control access to unauthorized or secured areas; and prevent passage of contraband.

1.4 These test methods apply primarily to detention hollow metal vision systems between secure areas generally found inside a detention/correctional facility such as: day rooms, control rooms, cells, and sally ports. These test methods are applicable to vision systems other than hollow metal, provided testing and reporting procedures are followed.

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

1.6 *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]

E2074 Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies (Withdrawn 2007)[3]

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

F1577 Test Methods for Detention Locks for Swinging Doors

F1643 Test Methods for Detention Sliding Door Locking Device Assembly

F1758 Test Methods for Detention Hinges Used on Detention-Grade Swinging Doors

F1915 Test Methods for Glazing for Detention Facilities

2.2 *ANSI/NAAMM/HMMA Standard:*[4]

ANSI/HMMA 863-04 Guide Specifications for Detention Security Hollow Metal Doors and Frames

2.3 *NFPA Standard:*[5]

NFPA 252 Methods of Fire Tests of Door Assemblies

2.4 *UL Standards:*[6]

UL-10 (C) Fire Tests of Door Assemblies

UL-752 Bullet Resisting Equipment

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *borrowed light, n*—fixed window frame for use in an interior partition.

3.1.1.1 *Discussion*—This term is derived from the concept of borrowing light from one room or space to help illuminate another.

3.1.2 *butt joint, n*—corner or mullion joint of a frame in which the stop of either member is notched to fit the other, resulting in a perpendicular joint.

3.1.3 *component, n*—subassembly, as distinguished from a part, that combines with other components to make up a total frame assembly.

3.1.3.1 *Discussion*—The prime components of a fixed vision system assembly are frame, wall, glazing, and panels.

[1] These test methods are under the jurisdiction of ASTM Committee F33 on Detention and Correctional Facilities and 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] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from Hollow Metal Manufacturer's Association, A Division of NAAMM, 600 S. Federal St., Chicago, IL 60605.

[5] Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269-9101.

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

3.1.4 *contraband breach, n*—any through opening created such that a 0.060-in. (1.5-mm) diameter wire can be passed completely through the assembly at any location constitutes a contraband breach.

3.1.5 *detention security, n*—ensurance of the restriction of mobility of inmates to designated areas within a correctional or detention facility.

3.1.6 *forcible egress, n*—ability to pass a 5 by 8 by 8-in. (127 by 203 by 203 mm) rigid rectangular box through an opening in the test sample created by destructive testing procedures using no more than 10 lbf (44.5 N).

3.1.7 *glazing stop, n*—formed metal section used to secure glazing or panel in a frame either by application to the glazing material or as an integral part of the frame.

3.1.8 *head or header, n*—horizontal member that forms the top of a frame.

3.1.9 *hollow metal, n*—term used in reference to such items as doors, frames, partitions, enclosures, and other items that are fabricated from metal sheet, usually carbon steel.

3.1.9.1 *Discussion*—These products are usually internally reinforced but hollow, hence the term hollow metal. In doors and partitions, the voids are normally filled with insulation. In frames, the jambs and sometimes heads are grouted where installed in masonry walls, or of such construction that they may be left hollow[7] (see ANSI/HMMA 863-04).

3.1.10 *jamb, n*—vertical member forming the side of a frame.

3.1.11 *miter joint, n*—corner joint of a head and jamb in which the trim faces, and sometimes the stops, meet at an angle (usually 45°).

3.1.11.1 *Discussion*—The miter joint can be either punched in the flat form or sawed after the members are formed.

3.1.12 *mullion, n*—vertical or horizontal member within a frame, separating either doors, a door and a sidelight, glazed areas, or panels.

3.1.13 *multi-light, n*—two or more fixed lights or glazing, located adjacent to each other, horizontally, vertically, or both within the same frame, either located in an interior partition or in an exterior wall.

3.1.14 *panel, n*—for the purposes of these test methods, the *panel* is a steel plate at least 0.375 in. (9.5 mm) thick, installed to transfer impact energy to the glazing stops and the assembly.

3.1.15 *performance characteristic, n*—response of the assembly or its components to any one of the tests described herein.

3.1.16 *sidelight, n*—fixed light of glazing located adjacent to a door or doors within the same frame.

3.1.17 *sill, n*—bottom horizontal member of a frame.

3.1.18 *tamper-resistant security screw, n*—screw that is designed to be removed only by special tools kept by detention/correctional facility maintenance personnel.

3.1.18.1 *Discussion*—The screws should be resistant to removal by means other than use of the appropriate special tool. In some cases, tamper-resistant security screws are furnished with twist-off heads such that a means of removal after final installation is not provided. Regarding impact resistance, the frame manufacturer may choose various grades (strengths) and sizes of tamper-resistant screws, and may install them at various spacings to obtain satisfactory test results. All information regarding the tamper-resistant security screws used by the manufacturer shall be provided as part of test reports.

3.1.19 *test completion, n*—conduct of one test sequence for each of the frame assemblies.

3.1.20 *testing laboratory, n*—independent materials testing laboratory not associated with the manufacturer.

3.1.21 *vision system, n*—hollow metal frame with glazing, glazing stops, and panels in place ready for service.

3.1.21.1 *Discussion*—A *vision system* may be a borrowed light or sidelight.

3.1.22 *vision system frame, n*—assembly of members surrounding and supporting glazing panels, steel panels, or combinations thereof, located either in an interior partition or exterior wall.

3.1.22.1 *Discussion*—If an exterior application is desired, other standards that address cutting and deflection may be applicable.

4. Significance and Use

4.1 A major concern for corrections administration officials is the resistance of security barriers used in detention/correctional facilities to certain types of physical attack that it is reasonable to expect in the field. These test methods are designed to aid in identifying a level of physical security for fixed detention hollow metal vision systems.

4.2 These test methods are not intended to provide a measure of resistance for a vision system subjected to attack by corrosive agents, high-powered rifles, explosives, sawing, or other such methods. These test methods are intended to evaluate the resistance of a vision system to violent attacks using battering devices such as benches, bunks, fire extinguishers, or tables; hand guns up to and including the .44 magnum; and fires started by using mattresses, books, and similar flammable materials.

4.3 The primary purpose or result of this standard is to provide detailed test methods that approximate the levels of abuse to which it is possible that vision systems become subjected in the field. The desired result of its use is to give assurance of protection to the public, to prison administrative personnel, and to the inmates themselves in the event of such attack.

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

[7] See The Hollow Metal Manual-87, available from the Hollow Metal Manufacturer's Association, A Division of NAAMM, 600 S. Federal St., Chicago, IL 60605.

5. Sampling

5.1 Sample frame assemblies shall be representative of the types and styles intended for use in the application outlined in 1.4.

5.2 The manufacturer shall permanently mark the test samples and retain them at the manufacturing facility for future reference for a period of at least one year from test date. As an alternative to retaining test samples, the manufacturer shall contract with the testing laboratory to provide a certified procedure for the construction of tested assemblies with factory follow-up inspection service as an option (see 8.2).

5.3 Test reports shall include complete details of test assemblies, details or photographs of the testing apparatus, or both, and installation instructions including templates for all items of hardware (see 8.3).

5.4 In the event of failure in one or more of the performance tests, the manufacturer shall provide another complete test sample with test wall where applicable.

6. Specimen Preparation

6.1 *Construction:*

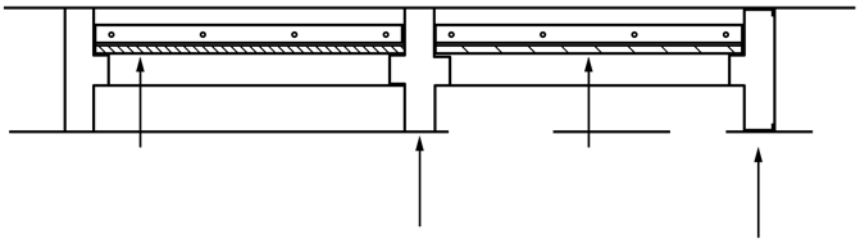
6.1.1 The construction and size of the sample vision system assemblies shall be representative of the application under investigation and shall include the multilight (borrowed light) and sidelight configurations as shown in Fig. 1 and Fig. 2.

6.1.2 The vision system assembly support fixture shall simulate the rigidity normally provided to a vision system in a building by the ceiling, floor, and walls. Fig. 3 shows an acceptable fixture for the sidelight configuration. Fig. 4 shows an acceptable fixture for the multilight (borrowed light) configuration.

6.1.3 *Description of the Test Wall*—The test fixture for the vision system shall include a vertical masonry wall section constructed suitably to retain the sample throughout the testing procedure. The wall specification shall be included as part of the test report.

6.2 *Mounting for Testin:*

6.2.1 The vision system sample shall be mounted such that the removable glazing stops are mounted on the side of the glazing or panel opposite the impact test ram. In this test configuration, the removable glazing stops and screws must prevent the glazing or panel from being forced out of the opening by ram impacts.



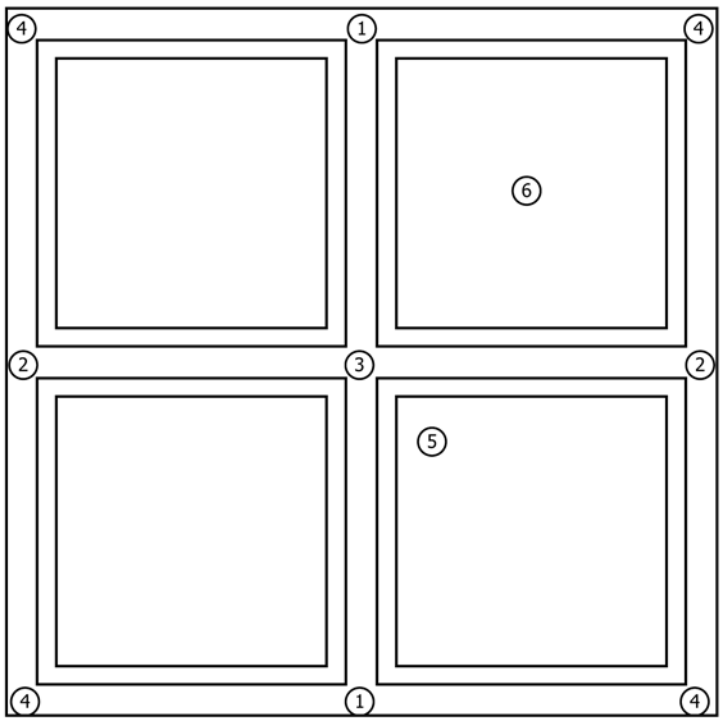


FIG. 1 Test Assembly Elevation Location of Strike Points Described in Table 1

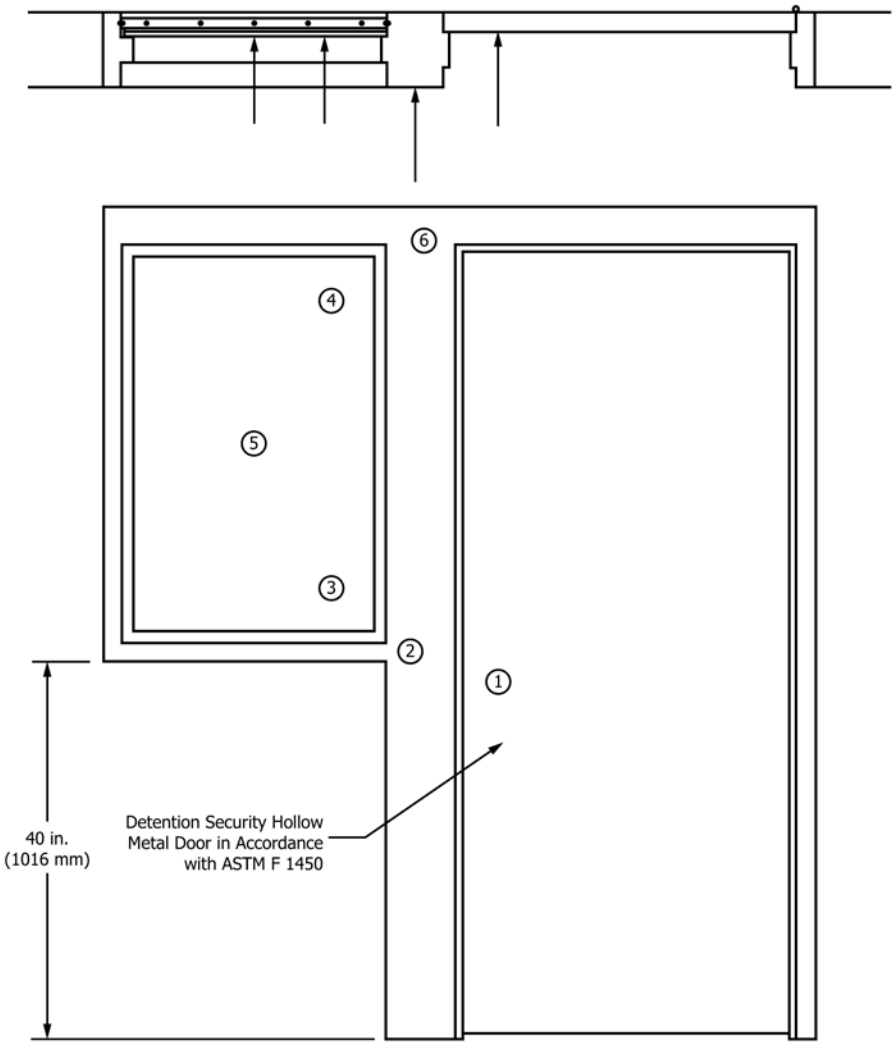


FIG. 2 Test Assembly Elevation Location of Strike Points Described in Table 2

6.2.2 Install components such as frames, glazing or panels, and glazing stops in the component test fixture as described in 6.1. Provide clearances around glazing or panels and install sealant or gasketing in accordance with the manufacturer's recommendations. Manufacturer's recommendations and instructions shall be included as part of test reports.

7. Test Methods

7.1 *Bullet Penetration:*

7.1.1 When specified by the contract documents of a detention/correctional facility project, test the vision system assemblies for bullet penetration in accordance with UL-752.

7.1.2 Testing of the frame, security glazing, or panels as individual components is acceptable if conducted in accordance with UL-752. The level of performance shall meet the rating of Level 3: .44 magnum.

7.1.3 Pass/fail criteria for bullet penetration shall be in accordance with UL-752.

7.1.4 *Precision and Bias*—No statement is made about either the precision or bias of the bullet penetration test method in these test methods since the result merely states whether there is conformance to the criteria for success specified in the procedure.

7.2 *Vision System Impact Test:*

7.2.1 *Scope*—This test method is designed to evaluate the capability of a hollow metal vision system including frame, glazing/panels, door and wall anchoring 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 to unauthorized areas. The test results have the potential to be used to aid in identifying a level of physical security for various configurations of detention hollow metal vision systems.

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

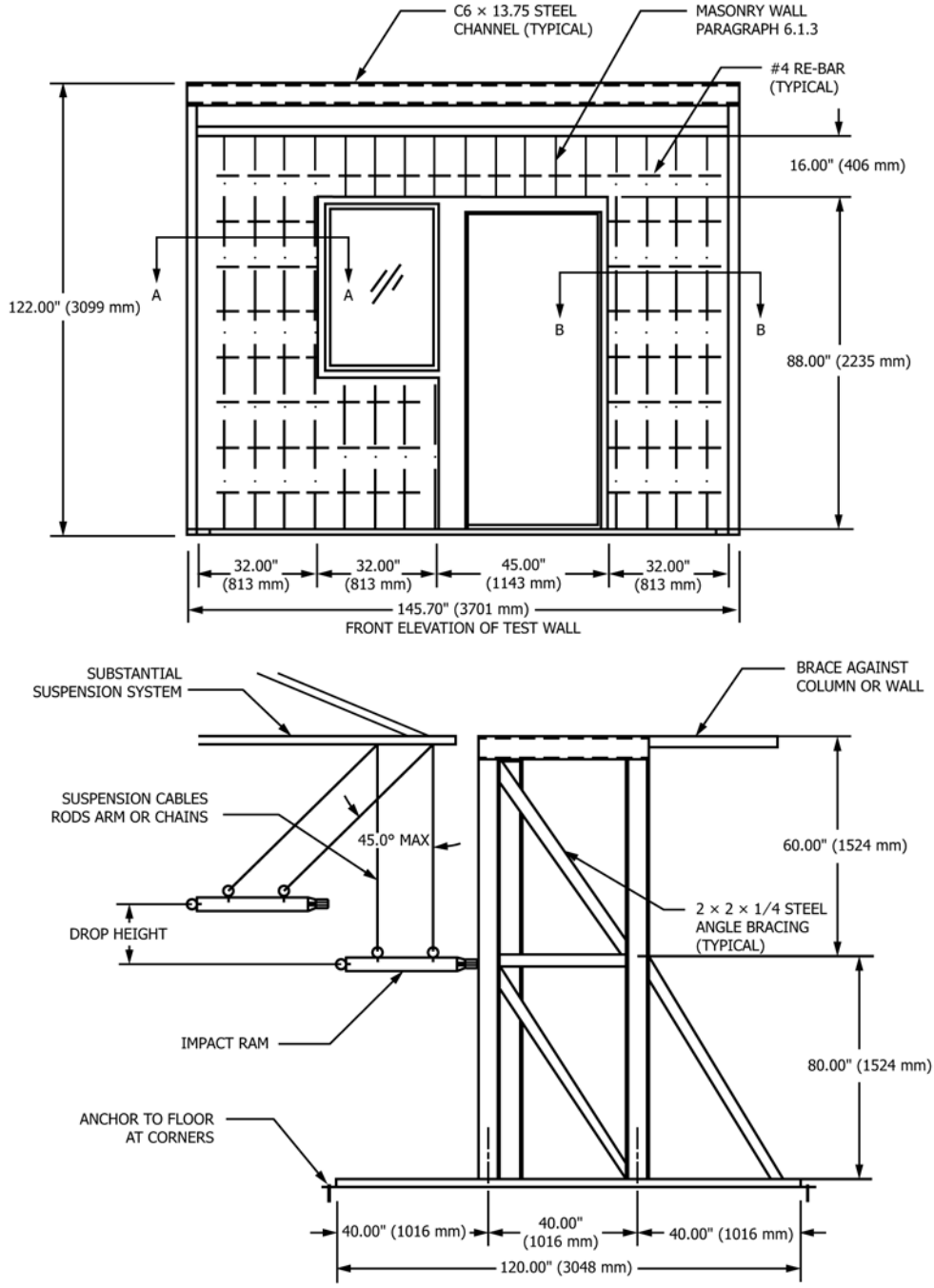


FIG. 3 Test Wall Detention Hollow Metal Vision Systems

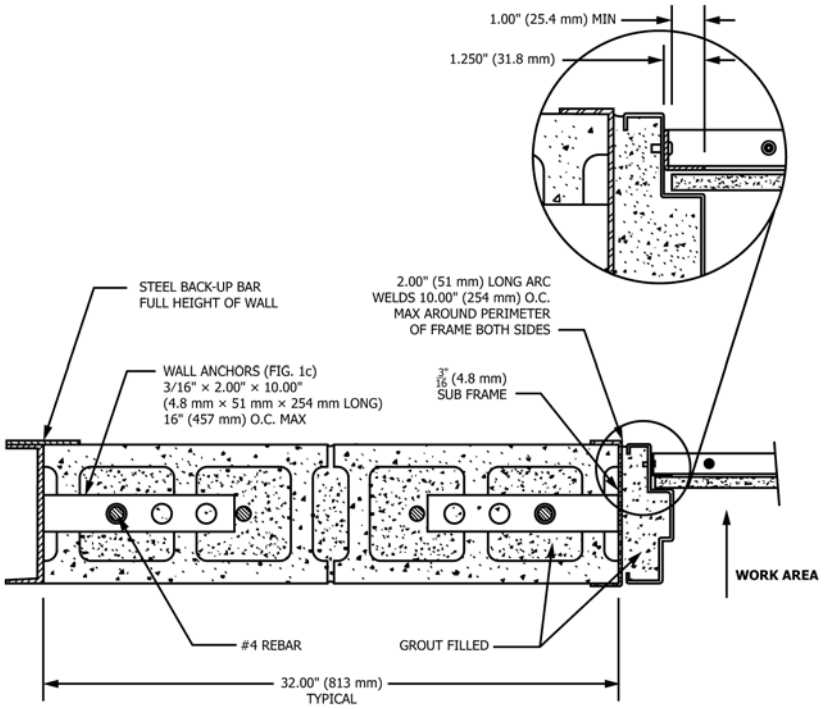


FIG. 3 a Section A-A *(continued)*

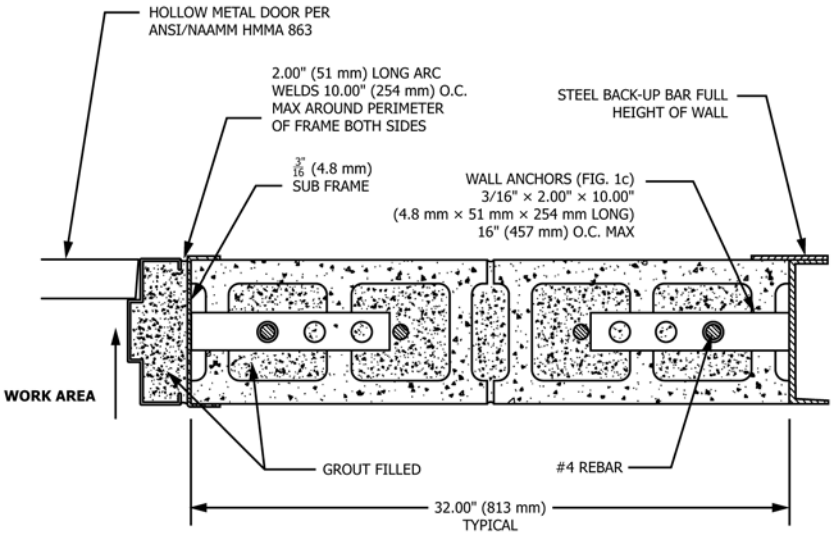


FIG. 3 b Section B-B *(continued)*

7.2.3 *Apparatus:*

7.2.3.1 *Impact Ram*—The impact ram shall be a pendulum system with a steel weight capable of delivering horizontal impacts of up to 200 ft · lbf (271.2 J). The weight of the ram shall be 80 ± 0.25 lb (36.0 ± 0.10 kg). The striking nose of the ram shall be made from C1010–1020 carbon steel, the striking surface area of which shall be 4 ± 0.04 in.^{2} (2580 ± 25.8 mm^2) (see Fig. 5).

7.2.4 *Procedure:*

7.2.4.1 With the test fixture and test apparatus, deliver the series of impacts listed in Table 1 (see Fig. 1) and Table 2 (see Fig. 2) to the assembly opposite the glazing stop side of the glazing/panel.

7.2.4.2 The glazing, panels, glazing stop, or frame that is damaged to the extent that forcible egress can be achieved constitutes failure.

7.3 *Vision System Fire Test:*

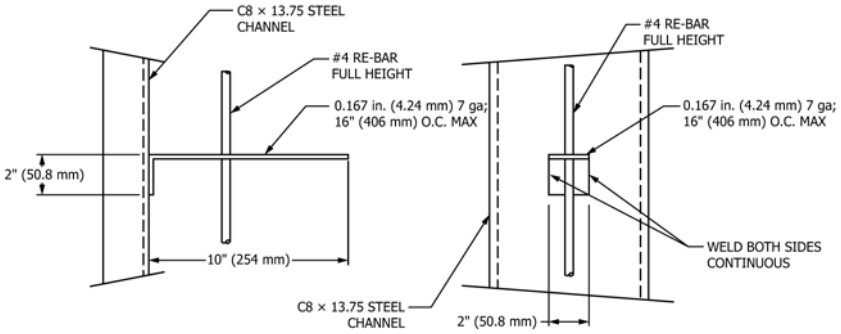


FIG. 3 c Wall Anchor Welding Detention Hollow Metal Vision Systems *(continued)*

7.3.1 When specified by the contract documents of a detention/correctional facility project, vision system assemblies shall be fire tested in accordance with UL-10C or NFPA 252.

7.3.2 Manufacturers shall be permitted to omit or add options within the assembly at their discretion, recognizing that the omission of an option in the fire test will prevent them from including that option in production models that are required to carry a fire rating.

7.3.3 The pass/fail criteria and criteria for assignment of fire ratings shall be in accordance with UL-10C or NFPA 252.

8. Certification and Reports

8.1 *Certification*—At the manufacturer's option, a manufacturer's certification that the assembly was manufactured and tested in accordance with these test methods, together with a complete test report shall be furnished by the manufacturer.

8.2 *Manufacturers Procedure*—The manufacturer shall be permitted to contract with a testing laboratory to provide the manufacturer with a certified procedure for the construction of tested assemblies with factory follow-up inspection service as an option.

8.3 *Reports*—Report the following information:

8.3.1 Name and address of laboratory.

8.3.2 Date the laboratory completed tests.

8.3.3 Name and address of vision system assembly manufacturer.

8.3.4 Description of identifying markings on all components of the test assembly.

8.3.5 Location of testing equipment.

8.3.6 Diagrams, details, and photographs of testing equipment.

8.3.7 Specification and details of components of the test assembly including test assembly drawings, glazing/panel specifications, wall specifications, frame component drawings, details on anchoring devices, and specifications, and product data sheet on security screws.

8.3.8 All test data.

9. Keywords

9.1 battering ram; correctional facility; detention facility; detention security; fire test; frame; hollow metal; fixed detention hollow metal vision system; impact test; physical security; security hollow metal

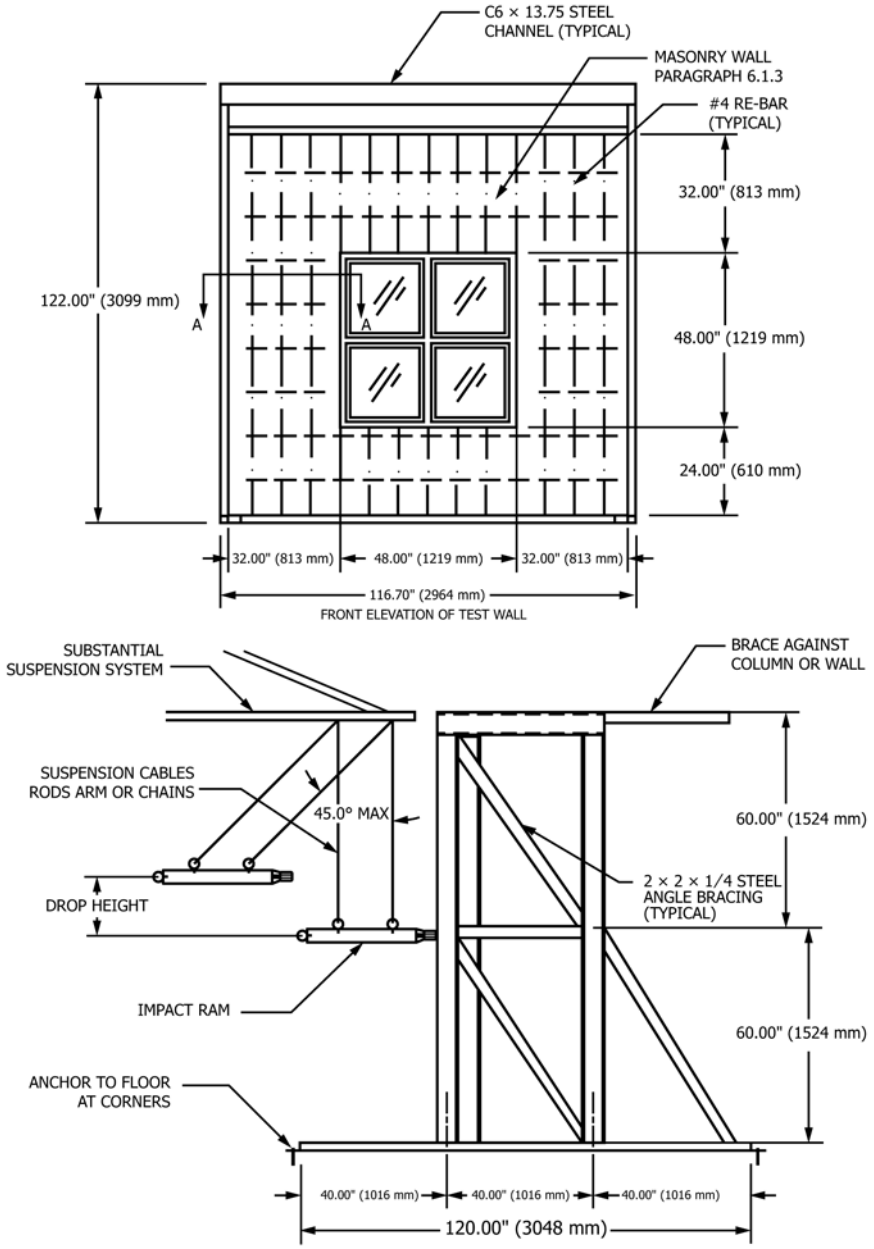
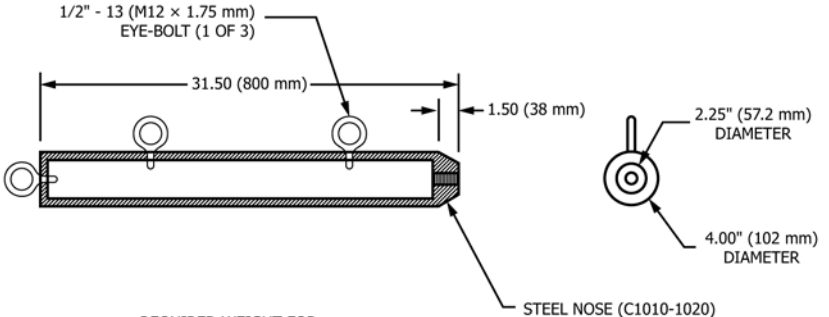


FIG. 4 Test Wall Detention Hollow Metal Vision Systems



NOTE: TO PREVENT SHIFTING DURING TEST PROCEDURES, ANY MATERIAL ADDED INSIDE OR OUTSIDE THE RAM TO SATISFY THE WEIGHT REQUIREMENTS SHALL BE RIGIDLY ATTACHED

FIG 5A: STEEL IMPACT RAM

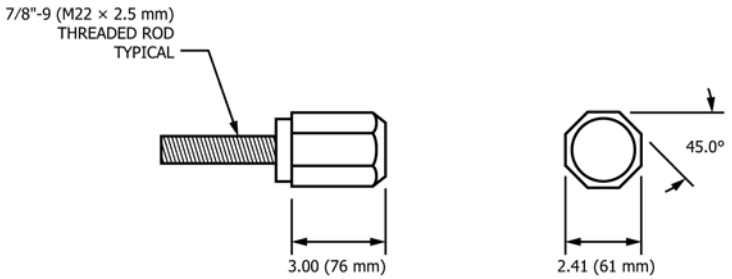


FIG 5B: BLUNT IMPACTOR

FIG. 5 Steel Impact Ram Detention Hollow Metal Vision Systems

TABLE 1 Impact Series for Frame and Glazing/Panel Impact Test Multilight Frame, Fig. 1

Sequence[A]	No. of Blows Grade 1	No. of Blows Grade 2	No. of Blows Grade 3	No. of Blows Grade 4	Impact Energy of Each Blow ft · lbf (J)	Location of Blows
						Frame
1	600	400	200	100	200 (271.2)	On the frame joint between the vertical mullion and the sill or head (test agent to select at time of test)
2	600	400	200	100	200 (271.2)	On the frame joint between the horizontal mullion and the jamb (either side, test agent to select at time of test)
3	600	400	200	100	200 (271.2)	On the frame joint where the vertical and horizontal mullions cross
4	600	400	200	100	200 (271.2)	On the frame joint between the jamb and sill or head (either side, test agent to select at time of test)
						Glazing
5	600	400	200	100	200 (271.2)	On the glazing/panel at the corner of the glazing/panel within 6 in. (15.2 cm) of the frame stop. Corner selected by the test agent at time of test
6	600	400	200	100	200 (271.2)	On the glazing/panel at the center of the glazing/panel. Glazing/panel to be selected by the test agent at time of test
Cyclic sequence	200	200	100	50		
Total Impacts	3600	2400	1200	600		
Total Approximate Time	6 h	4 h	2 h	1 h		

[A] The cyclic sequence of impacts will be as indicated by the grade number, and then move to the next sequence number location. If the testing agent observes a location in the assembly where failure is beginning to occur, the testing agent may alter the test sequence to attack the weakened location.

TABLE 2 Impact Series for Frame and Glazing/Panel Impact Test Sidelight Frame, Fig. 2

Sequence[A]	No. of Blows Grade 1	No. of Blows Grade 2	No. of Blows Grade 3	No. of Blows Grade 4	Impact Energy of Each Blow ft · lbf (J)	Location of Blows
						Frame
1	600	400	200	100	200 (271.2)	At mid-height on the door, 6 in. (152 mm) maximum horizontally from the lock edge.
2	600	400	200	100	200 (271.2)	On the frame joint between the side-light sill and the strike mullion.
						Glazing/Panel
3	600	400	200	100	200 (271.2)	On the glazing/panel at the corner of the glazing/panel closest to the joint between the side-light sill and the strike mullion, within 6 in. (15.2 cm) of the frame stop.
4	600	400	200	100	200 (271.2)	On the glazing/panel at the corner of the glazing/panel closest to the joint between the strike mullion and the header within 6 in. (15.2 cm) of the frame stop.
5	600	400	200	100	200 (271.2)	On the glazing/panel at the center of the glazing/panel.
						Frame
6	600	400	200	100	200 (271.2)	On the frame joint between the strike mullion and the header.
Cyclic sequence	200	200	100	50		
Total Impacts	3600	2400	1200	600		
Total approximate Time	6 h	4 h	2 h	1 h		

[A] The cyclic sequence of impacts will be as indicated by the grade number, and then move to the next sequence number location. If the testing agent observes a location in the assembly where failure is beginning to occur, the testing agent may alter the test sequence to attack the weakened location.

APPENDIXES

X1. RELATED STANDARDS

X1.1 These test methods are part of a family of interrelated standards developed to work together using common testing approaches and grade classifications to address the specific needs of detention and correctional facilities, including the following: Test Methods F1450, F1577, F1592, F1643, F1758, and F1915.

X1.2 This Appendix is intended to explain some of the common approaches underlying the test methods noted above, including how to distinguish between primary and secondary materials and test objectives.

X1.3 Primary is typically an entire full-scale operating assembly of many components and materials that are tested together, whereas secondary is individual components that are only a portion of a whole assembly.

X1.4 In some instances, components that are secondary in one test become primary under a distinct and separate related standard developed specifically for that component. These separate standards typically apply more rigorous test methods to fully exploit susceptibilities unique to that component.

X1.5 Titles of related standards indicated above pertain to performance objectives for the primary component or assembly. This is explained further in examples below.

X1.6 Each related standard contains grades or levels of performance developed: to restrict passage to unauthorized areas, to delay and frustrate escape attempts, and to resist vandalism. These grades or levels were developed based on an attacker's predicted ingenuity using "riot-like" attack methods, modified depending upon strengths and weaknesses of various components. Attack sequence format(s), impact intensities, test duration(s), and tools utilized are comparable from one standard to another. Using the established security grades, a user is given reasonable assurance that components and assemblies will perform satisfactorily at their tested security grade levels. These security grades establish specific measurements of performance of the primary assembly or component material.

X1.7 *Test Methods* F1450—Attack impact test methods incorporated into Test Methods F1450 address performance characteristics of door assemblies, including constituent doors, door frames, and sub-components installed and operating as they would normally function in an actual detention or correctional facility. Components installed in test doors and frames are intended to be certified by their applicable separate component standard performance. For example, separately certify components to standards as follows: locks to Test Methods F1577, hinges to Test Methods F1758, sliding door devices to Test Methods F1643, and glazing to Test Methods F1915.

X1.8 *Test Methods* F1592:

X1.8.1 Impact test method(s) for Test Methods F1592 address not only the performance characteristics of doors and door frames, but also side light and multiple light frame assemblies, again, with all necessary components installed to form a full scale operating assembly. Once again, it is intended that individual components should be certified under their separate applicable standards.

X1.8.2 Users of detention components should review the related standards applicable to those components and their test reports for comparable attack testing grade or level of performance.

X1.8.3 Since the primary subjects of attack under Test Methods F1592 are the frame construction, glazing stops, and fasteners, a consistent steel impact "panel" may be substituted for uniformity of test results, instead of using actual security glazing. This substitution also applies to Test Methods F1450 door vision lights.

X1.9 *Complementary/Dual Certifications*:

X1.9.1 Manufacturers of components may work together to obtain multiple complementary certifications. For example, a lock manufacturer may team with a hollow metal manufacturer to conduct impact testing on an assembly under Test Methods F1450 and obtain dual certifications for impact test portions of both Test Methods F1450 and F1577, since the test methods in both are comparable.

X1.9.2 In another example, a security glazing manufacturer may team with a hollow metal manufacturer to obtain a complementary certification under Test Methods F1592. However, in this case, Test Methods F1915 requires additional testing of the security glazing that involves sharp as well as blunt attack tools, and application of heat using a torch during a blunt impact test. A security glazing product that performs well under Test Methods F1592 hollow metal frame testing may not satisfy all of the separate requirements of Test Methods F1915. Separate certification under Test Methods F1915 must also be obtained

X1.10 *Components Tested for Specific Susceptibilities*—Differences in attack testing under these two test methods (Test Methods F1915 and F1592) are related to performance degradation of some security glazing, undergoing attack testing at various thermal conditioning exposures, as well as the specific number of impacts. Test Methods F1915 contains impact tool attacks under both severe hot and cold conditioning, as well as a torch sequence combined with impact from blunt tools. Typically, heavily constructed detention hollow metal sheet is not as susceptible to these temperature changes, which is the reason why temperature conditioning is not included in impact testing for Test Methods F1592 or F1450 (except temperature conditioning for bullet resisting UL-752). Consequently, security glazing tested and certified under Test Methods F1915 provides superior assurance of performance across a range of environmental conditions not tested under most other previously existing standards.

X1.11 In conclusion, by choosing consistent grade levels from these related standards, a user can obtain greater assurance that both the security assembly and the multitude of constituent components are integrated to deliver the security performance required.

X2. REPRESENTATIVE BARRIER DURATION TIME

X2.1 The element of time shown in Table 1 and Table 2, is based upon historical testing observation that indicates that sustained manpower can deliver 600 blows of 200 ft·lb (271.2 J) each in 1 h. The table includes total numbers of impacts for each Grade Level, and total approximate times to deliver these numbers, excluding set up times for cyclic sequences. This 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 opening in the facility.

X3. COMBINATION TESTING AND TESTING SCHEDULE

X3.1 The test methods described in Test Methods F1450 and Test Methods F1592 are closely related and the test samples may be tested in various combinations in order to minimize duplicate or redundant testing.

X3.2 If such a combined test schedule is used, combined reporting may be incorporated, provided all required assemblies are addressed and subject to testing laboratory approval.

X3.3 The detention and corrections industry relies heavily upon the credibility of the testing of security door and vision system assemblies in accordance with these test methods, and the performance that successful testing helps to ensure. In consideration of the importance placed by the industry upon this product performance testing, the developers and reviewers of these test methods agree that retesting every five (5) years will help ensure that product designs and production methods remain reliable and do not exhibit performance degradation over time. This five (5) year retesting schedule coordinates well with the five (5) year review that is mandated by ASTM for all standards. By following this schedule, the industry is assured that if a review precipitates changes or additions to the testing procedures, then these new procedures will be utilized by the manufacturers and laboratories upon their next retesting cycle, thereby providing assurance that products are always being tested and retested in accordance with the most current revisions of the standards. However, in the interest of not requiring unnecessary testing, if the revisions to a standard during its review are editorial only, or if the standard is reapproved with no changes, retesting may be waived.