Standard Test Methods for Detention Hinges Used on Detention-Grade Swinging Doors[1]

This standard is issued under the fixed designation F1758; 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 the apparatus, procedures, and acceptance conditions for evaluating the normal operating performance characteristics and the performance characteristics under assault conditions of hinges used in swinging door assemblies in detention and correctional institutions. These types of hinges are described in detail in 3.1.6, 3.1.9, and 3.1.22. Thus, these test methods only give an indication of the performance characteristics of hinges in actual service. Such variables as installation and maintenance conditions which have a potential impact on performance characteristics are not considered.

1.2 It is the intent of these test methods to help ensure that detention hinges (reference to hinges is inclusive of a continuous hinge) perform at or above minimum acceptable levels to confine inmates, to delay and frustrate escape attempts, and to resist vandalism and assault conditions. It is recognized that in order to meet the intent of these test methods, door, frame and lock assemblies must be compatible with the level of performance required by Test Methods F1450 and F1577.

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

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

1.5 Consult NFPA 80 for Fire Doors & Windows concerning hinge requirements on fire doors.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F1450 Test Methods for Hollow Metal Swinging Door Assemblies for Detention and Correctional Facilities
F1577 Test Methods for Detention Locks for Swinging Doors
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 *NFPA Standard:*[3]

NFPA 80 Fire Doors and Fire Windows

2.3 *ANSI Standards:*[4]

ANSI/BHMA A156.1 Standard for Butts and Hinges
ANSI/NAAMM/HMMA 863 Guide Specifications for Detention Security Hollow Metal Doors and Frames

2.4 *UL Standard:*[5]

UL-752 Bullet Resisting Equipment

3. Terminology

3.1 *Definitions:*

3.1.1 *assault condition, adj*—performance characteristics associated with an attack from battering devices, and overload conditions.

3.1.2 *bearings, n*—friction reducing material or mechanism between the moving parts of a hinge. The coefficient of friction can be sliding or rolling.

[1] These test methods are under the jurisdiction of ASTM Committee F33 on Detention and Correctional Facilitiesand are the direct responsibility of Subcommittee F33.04 on Detention Hardware.

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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 National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269-9101.

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

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

3.1.2.1 *Discussion*—The coefficient of friction is of the sliding or rolling type.

3.1.3 *clearances, n*—vertical and lateral play in a hinge prior to the start of the cycle test.

3.1.4 *cycle, n*—rotation of the test door from the closed position (1 to 5°) to the open position (90 ± 5°) and back to the closed position again.

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

3.1.5.1 *Discussion*—The prime components of a door assembly include: door, door frame (includes hinge jamb, header, and strike jamb), hinges, and locking hardware.

3.1.6 *detention hinge, adj*—hinge having and complying with one or more security grades 1 to 4 as shown in Table 1.

3.1.6.1 *Discussion*—These hinges shall be constructed with a maximum security pin. They shall be permitted to be mounted in any of the styles described in 3.1.11 – 3.1.14. Alternate designs are acceptable, including the illustrations provided in ANSI 156.1, providing they meet the performance characteristics of these test methods.

3.1.7 *detention security, adj*—assurance of the restriction of movement of inmates to designated areas within a detention or correctional facility.

3.1.8 *door assembly, n*—unit comprised of a group of parts or components that make up an opening barrier for a passageway through a wall.

3.1.9 *door positioning/electric monitoring/etc., adj*—hinge designed with a monitoring device that is tripped when the door is opened.

3.1.9.1 *Discussion*—Ratings and design characteristics shall be permitted to vary among manufacturers.

3.1.10 *frame, n*—assembly of members surrounding and supporting a door or doors.

3.1.11 *full-mortise hinge, n*—hinge having one leaf mortised into the butt edge of a door and the other leaf mortised into the rabbet edge of a frame.

3.1.12 *full-surface hinge, n*—hinge having one leaf attached to the face of a door and the other leaf attached to the face of a door frame.

3.1.13 *half-mortise hinge, n*—hinge having one leaf mortised into the butt edge of a door and the other leaf attached to the face of a door frame.

3.1.14 *half-surface hinge, n*—hinge having one leaf attached to the face of a door and the other leaf mortised into the rabbet edge of a door frame.

3.1.15 *high frequency, adj*—testing period for which a minimum of 2 500 000 cycles have been completed with Grades 1 to 4 or a minimum of 500 000 cycles with a Grade 1 Double Weight.

3.1.16 *low frequency, adj*—testing period for which a minimum of 150 000 cycles have been completed.

3.1.17 *manufacturer, n*—party responsible for fabrication of a product.

3.1.18 *non-removeable pin, adj*—hinge pin that has been fixed after insertion by welding, pinning, or other permanent means to prevent pin removal. Use of set screws is not acceptable.

3.1.19 *normal operation, adj*—includes performance characteristics such as vertical and lateral wear rates and door operating forces required to overcome friction.

3.1.20 *performance characteristic, n*—the response of the detention hinge in any one of the tests described herein.

3.1.21 *permanent set, n*—plastic deformation that remains after releasing the stress that produces the deformation.

3.1.22 *power transfer/electric through-wire/electric transfer etc., adj*—hinge that allows power to be transferred from the jamb to the door through the hinge.

3.1.22.1 *Discussion*—Ratings and design characteristics shall be permitted to vary among manufacturers.

3.1.23 *swinging door, adj*—door equipped with hinges that permit it to swing about the vertical hinge axis, either right-hand, left-hand, right-hand reverse bevel, or left-hand reverse bevel, depending on hardware configuration.

TABLE 1 Cycle, Impact, and Overloading Testing Parameters and Acceptance Criteria

	Double Weight Grade 1	Grade 1[A]	Grade 2[A]	Grade 3[A]	Grade 4[A]
Test door weight, lb (kg)	600 (272)	300 (136)	250 (113)	200 (91)	200 (91)
Impacts per hinge[B]	200	200	150	75	35
Total impacts on hinged side of door[B]	600	600	450	225	105
Number of cycles:					
High frequency	500 000	2 500 000	2 500 000	2 500 000	2 500 000
Maximum frictional forces, lbf (N)	5 (22.3)	2 (8.9)	2 (8.9)	2 (8.9)	2 (8.9)
Low frequency	150 000	150 000	150 000	150 000	150 000
Maximum frictional forces, lbf (N)[C]	5 (22.3)	5 (22.3)	5 (22.3)	5 (22.3)	5 (22.3)
Maximum vertical wear, in. (mm)	0.020 (0.508)	0.020 (0.508)	0.030 (0.762)	0.030 (0.762)	0.030 (0.762)
Maximum lateral wear, in. (mm)	0.062 (1.575)	0.062 (1.575)	0.062 (1.575)	0.062 (1.575)	0.062 (1.575)
Clearance:					
Maximum vertical and lateral, in. (mm)[D]	0.015 (0.381)	0.015 (0.381)	0.015 (0.381)	0.015 (0.381)	0.015 (0.381)
Overload test:					
Permanent set, in. (mm)	0.062 (1.575)	0.062 (1.575)	0.062 (1.575)	0.062 (1.575)	0.062 (1.575)

[A] Security Grades 1 to 4 are based on Test Methods F1450 and F1577.
[B] Represents minimum number of 200 ft–lbf (271.2-J) impacts based on three locations per door.
[C] For applications with door closers, frictional forces for high-frequency use shall apply.
[D] See 6.1.1.

3.1.24 *test completion, n*—conduct of one test sequence for a group of hinges.

3.1.25 *testing laboratory, n*—independent material testing facility not associated with the manufacturer.

3.1.26 *wear, n*—displacements in the vertical and lateral directions of a detention hinge when subjected to a door cycle test.

4. Significance and Use

4.1 A major concern for detention and correctional administrative officials is the reliable operation of hinges used in their facilities. These test methods aid in assigning a level of physical security and performance to hinges for swinging door assemblies.

4.2 These test methods evaluate the effect on hinges of battering attacks on the door simulating assault conditions as well. These test methods also evaluate the performance of a hinge under simulated normal operation. These test methods do not provide a measure of the resistance or performance of a hinge to attack by the following: chemical agents, ballistics, explosives, or other extreme methods of attack, such as direct impact or manipulation on the hinges or to environmental elements such as rain, snow, or wind-carried dust or sand. Where such elements are a potential factor, consult the manufacturer.

4.3 The primary purpose of these test methods is to approximate the levels of abuse conditions and normal operating conditions to which hinges are subjected in detention and correctional institutions. These test methods attempt to do this through the different grade levels associated with cycle and impact testing. The desired result of these test methods will provide a measure of assurance of protection to the correctional personnel, public, and inmates.

5. Sampling

5.1 Sample hinges shall be representative of the types and styles intended for use in the application of these test methods.

5.2 The manufacturer shall permanently mark the test samples and retain them at the manufacturing facility for future reference. In lieu of test samples, the manufacturer shall be permitted to provide a certified test procedure.

5.3 The test assembly shall be certified by an independent third party testing and certification laboratory; any change of components or assembly methods or processes shall be certified in writing by the testing and certification laboratory. The laboratory shall have the sole authority to decide the extent and scope of retesting required.

5.4 Test reports shall include complete details and photographs of the test specimen, the testing apparatus and installation instructions including templates.

6. Cycle Testing

6.1 *Sample Preparation*—Conduct the test methods using three detention hinges per door. When testing a continuous-type hinge on a full door height sample, one hinge shall be used.

6.1.1 Prior to being mounted on the test doors, check fully assembled hinges for vertical and lateral clearances. Ensure all end play has been removed in each sample prior to this measurement. The clearance values shall not exceed those specified in Table 1.

6.1.2 Install the hinges, fully assembled, to the door per manufacturers' standard installation instructions.

6.1.2.1 At a minimum for alignment, lay a straightedge along the edge of the door at such position as corresponds to the back edge of a recommended mortise. In applying the hinges, firmly abut the back edge of the door leaf against this straightedge as the screws are applied and tightened. Apply jamb mounting blocks to the hinge jamb leaves using the screws supplied. Tighten screws in accordance with the fastener manufacturer's recommended tightening torque. Position the door with its three hinges and jamb mounting blocks against the vertical jamb, and apply the hexagon-head cap screws and lock washers finger tight. Align edges of jamb leaves with the straightedge and tighten cap screws securely. Do not mortise door and jamb leaves of the hinges.

6.2 *Apparatus*—Details of a typical test apparatus are in Appendix X1. Alternate designs of the test apparatus are acceptable only if the proper engineering evaluation is conducted.

6.2.1 The test door apparatus shall be designed in such a manner that the lateral loads or moment induced on the hinges under this test will be equivalent to the minimum value associated with a 3 by 7 ft door (914.4 by 2133.6 mm). Hinge spacing shall be in accordance with ANSI/NAAMM/HMMA 863. Refer to Appendix X2 for lateral load calculations. An oversized door shall be permitted to be tested separately or certified in accordance with 9.5.

6.3 *Procedure*—Add the proper amount of additional weights to the apparatus for the grade level being tested in Table 1.

6.3.1 Prior to the start of the cycle test perform the following:

6.3.1.1 Determine a measurement location for vertical and lateral wear on all hinges. The location shall be the same each time a measurement is taken. The angular position of the door shall also be the same within 2 in. (50.8 mm) for each measurement. Record vertical and lateral measurements for all hinges. Vertical measurement is between the adjacent jamb and door knuckles. Lateral measurement is between the inner edge of jamb leaf and adjacent door knuckle. If the location is at the center of the hinge, one measurement per hinge at the center shall suffice. If the location is not at the center of the hinge, two measurements, equally distant from the center of hinge as practicable, shall be taken; the qualifying lateral measurement is the average of the two. Alternate methods of measuring vertical and lateral wear may be employed providing they comply with X1.3.5.

6.3.1.2 Measure and record force to overcome friction or out-of-balance condition. This shall be done 30 in. (762 mm) from the hinge pivot center after the door has been cycled 20 times from the fully closed to the fully opened positions. The measurement shall be made perpendicular to the door and shall be the force to get the door moving (static) and not the force to sustain motion (dynamic).

6.3.1.3 Commence cycling at an average rate of 10 to 20 cycles/min for test doors weighing 200 to 300 lb (91 to 136 kg) (Grades 1–4). For Double Weight Grade 1 type doors, cycle at a rate up to 10 cycles/min. Because of test scheduling demands, the manufacturer or test laboratory shall be permitted to elect to design an apparatus which is capable of safely withstanding higher cycle rates. It is understood that any hinge subjected to higher rates is being subjected to a more stringent test.

6.3.1.4 During cycle testing, it is recommended that a log be kept of periodic cycle counts and wear measurements on each test sample. The frequency of data entries shall be agreed upon between the manufacturer and the testing laboratory.

6.3.1.5 At the conclusion of the cycle test under the predetermined grade level and frequency level in Table 1, measure each sample in accordance with 6.3.1.1 to determine the displacement between leaves and knuckles. Record measurements of wear for all hinges.

6.3.1.6 At the completion of the cycle test check the force to overcome friction in accordance with 6.3.1.2.

6.4 *Test Completion and Condition of Acceptance*—For a hinge to be acceptable for the grade level and frequency level being tested, the performance characteristics associated with the cycle test shall not exceed any of the values in Table 1.

6.5 *Precision and Bias*—No information is presented about either the precision or bias of the cycle test within these test methods since the test result is non-quantitative.

7. Overload Test Method

7.1 *Significance and Use*—This test method simulates personnel hanging or swinging from the edge of the door farthest from the hinge centerline.

7.2 *Procedure*—An overload test shall be performed after the cycle test using the same setup and door weights. With the test door apparatus at 0° (closed position), add and remove 300 lb (136 kg) at a location on the test door which represents the width of the detention door being certified.

7.3 *Test Method Completion and Conditions of Acceptance*—Lateral shift or permanent set away from the top hinge shall not exceed the value in Table 1. Refer to 6.3.1.1 for lateral measurement.

7.4 *Precision and Bias*—No information is presented about either the precision or bias of the overload test within these test methods since the test result is non-quantitative.

8. Hinge Impact Test Method

8.1 *Apparatus*—Impact test apparatus shall be capable of delivering 200 ft–lbf (271.2 J) of energy. The striking end of the ram shall be made from C1010–1020 Carbon Steel, the striking surface area of which shall be 4.0 ± 0.04 in.^{2} (25.8 ± 0.258 cm^2). The weight shall be 80 lb (36 kg).

8.1.1 Test door panel and frame, in addition to anchoring of the apparatus, shall have material strength and stiffness similar to a detention door assembly to the extent that the energy transfer through the hinges will be accurately represented. Examples of impact testing apparatuses are found in Test Methods F1450 (swinging doors). Alternate design of the test apparatus are acceptable providing the proper engineering evaluation is made.

8.1.2 *Calculation of Energy:*

8.1.2.1 Calculate energy developed by ram pendulum as follows:

$$E = Wh \tag{1}$$

where:

E = energy developed by ram with initial velocity of zero,
W = weight of ram, 80 lb (36 kg), and
h = drop height of ram.

8.1.2.2 Either W or h shall be permitted to be varied (within the range calculated) to get the required energy of 200 ft–lbf (271.2 J).

8.2 *Procedure*—Using the apparatus in accordance with 8.1, deliver the number of impacts of 200 ft–lbf (271.2 J) as required for the grade level under test in Table 1. The impact point for a particular hinge shall be on the test door panel no further than 6 in. (with no direct impacts on the hinge) from the vertical centerline of the hinge and shall be aligned with the horizontal centerline of the hinge. Make the impacts against this door from the opposite side of the hinges in the direction of door swing. For continuous hinges, the impact point shall be a distance no further than 6 in. from the vertical centerline of the hinge (with no direct impacts on the hinge) and at a horizontal location equivalent to the hinge locations specified in ANSI/NAAMM HMMA 863.

8.3 *Test Completion and Condition of Acceptance*—The following two conditions must be met for the hinges to be acceptable:

8.3.1 The test door shall remain closed throughout the test.

8.3.2 When the lock side has been disengaged, the test door shall open enough to provide normal personnel egress.

8.4 *Precision and Bias*—No information is presented about either the precision or bias of this impact test within these test methods since the test result is non-quantitative.

9. Certification

9.1 A manufacturer's certification that the product was tested in accordance with these test methods, together with a complete test report, shall be furnished by the manufacturer in accordance with 5.4.

9.2 If the test assembly is to be certified by an independent, third-party testing and certification laboratory, any change of components or assembly methods or processes shall be certified in writing by the testing laboratory. The laboratory shall have the sole authority to decide the extent and scope of retesting required.

9.3 *Manufacturer's Procedure*—The manufacturer shall be permitted to elect to contract with the testing laboratory to provide the manufacturer with a certified procedure for the manufacturer testing of product with testing laboratory follow-up inspection service at the factory.

9.4 Tests are certified with the highest security level being Grade 1 and the lowest being Grade 4. The highest grade level achieved by the test sample shall have satisfied all lesser grades.

9.5 Oversized doors larger than 3 by 7 ft (914.4 by 2133.6 mm) shall be permitted to be tested and certified separately or additional hinges shall be permitted to be added if required without further cycle testing provided the proper engineering analysis (refer to Appendix X2) is performed.

10. Report

10.1 Report the following information:

10.1.1 Name and address of the testing laboratory,

10.1.2 Date the testing laboratory completed the tests,

10.1.3 Name and address of the manufacturer and the hinge model number,

10.1.4 Description of identifying markings on all components of the test apparatus,

10.1.5 Location of the testing apparatus,

10.1.6 Diagrams, details, and photographs of the testing apparatus,

10.1.7 Specifications and details of components of the test apparatus including test apparatus drawings, door and frame component drawings, hardware templates and instructions, wall specifications, and details on anchoring devices, and

10.1.8 All test data results.

11. Keywords

11.1 assault condition; correctional facility; detention facility; detention hinges; detention security; normal operation

APPENDIXES

(Nonmandatory Information)

X1. TEST APPARATUS

X1.1 *Cycle Test Actuator*—The actuator for operating the cycle test shall produce a door angular velocity characteristic of a sinusoidal curve. Fine tuning of actuator speed (cycle speed) may be necessary to provide smooth operation when changing door weights. Each cycle shall start and end at a point 1 to 5° from the normal closed position of the door and swing open through 90 ± 5° and return.

X1.2 *Cycle Counter*—Mechanical or electrical counters which register 1 cycle for each complete opening and closing of test door.

X1.3 *Doors and Frames*:

X1.3.1 *Door*—Provide a door that is not mortised for hinges or a skeletonized structure having an equivalent center of gravity in all directions after weights are applied. The hinge-mounting surface of a door shall be a continuous steel strip with a minimum thickness of ¼ in. (6.4 mm). The dimension from the hinge axis to the edges of the mounting surfaces and to a plane parallel to the door face through the center of gravity of the door are listed in Fig. X1.1 for all sizes of square, full-mortise hinges.

X1.3.2 *Jamb*—A rigid, vertical steel jamb that is not mortised for hinges with a minimum thickness of ¼ in. (6.4 mm) shall be erected to hang the test door. Hinge mounting surfaces shall lie in the same plane and be plumb. Door stops or latching devices shall not be used. The door shall swing freely through a 90° test arc.

X1.3.3 *Blocks*—Steel jamb mounting blocks with a ¼-in. (6.4-mm) minimum thickness shall be provided for each of the hinges. They shall be of such rectangular dimensions as shall accommodate the leaves of the specimens and shall be oversized to the extent that three ½ in.–20 × ¾ in. (12.7 mm–20 × 19 mm) hexagon head cap screws plus lock washers shall be applied to each block making it tight to the jamb (Fig. X1.1). Holes for these cap screws shall be of such diameter as shall permit ⅛-in. (3.2-mm) adjustment in all mounting plane directions before tightening.

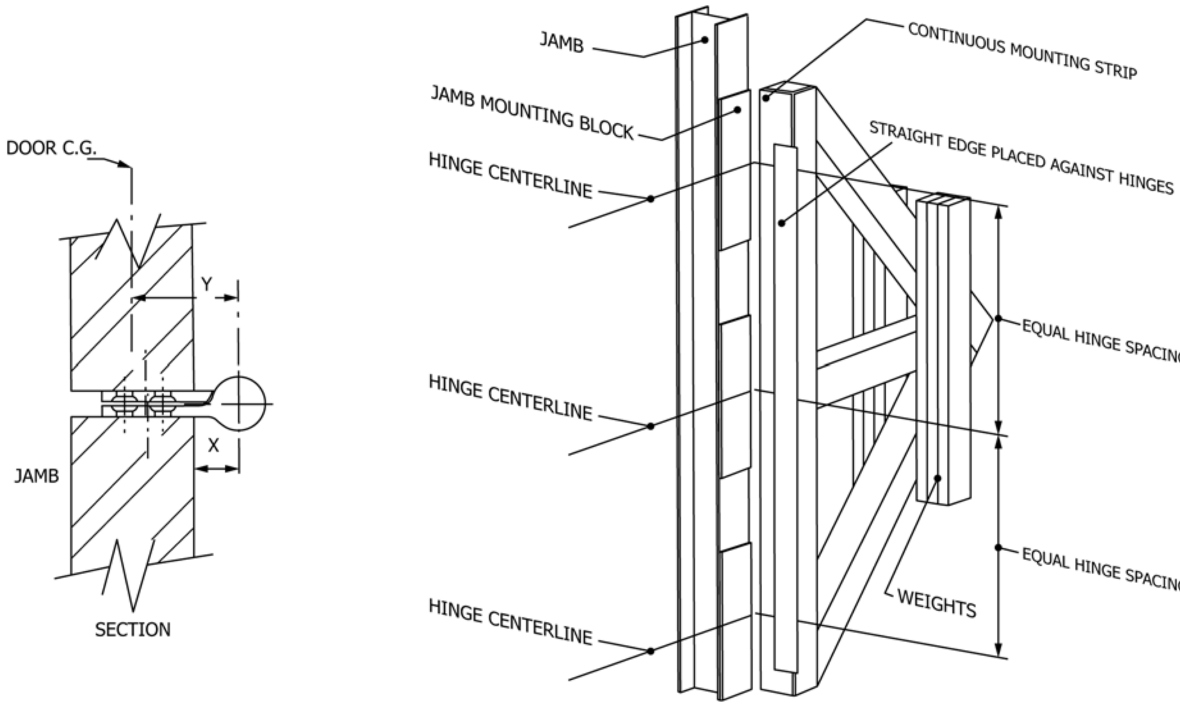
X1.3.4 *Drilling*—Hinge jamb mounting blocks as well as door hinge mounting surface shall be drilled and tapped in accordance with the following:

Template: Within 0.005 in. (0.13 mm) of true position as shown by the manufacturer's template drawing. Non-template: Within 0.005 in. (0.13 mm) of the hole locations of the particular test specimen. Both hole patterns shall be accurately placed so that the hinge-pin axes are normally colinear.

X1.3.5 *Instruments*—Precision instruments suitable for measuring lateral and vertical wear and friction accurate within 5 % of Table 1 values are required. Calibrations shall be made to known standards.

X1.3.6 *Lubricants*—Hinges may be lubricated during the test only in accordance with manufacturer's required maintenance procedures.

X1.3.7 *Test Environment*—Tests shall be conducted in ambient room atmospheric conditions.



Test Hinge Data	Mounting Dimensions
4½ by 4½	*X* ¾ (19) *Y* 1⅝ (41.3)
5 by 5	*X* 1 (25.4) *Y* 1⅞ (47.6)

FIG. X1.1 Typical Cycle Test Apparatus

X2. CALCULATION OF LATERAL LOAD

X2.1 Calculate the lateral load at the top and bottom hinge of any standard door assembly or test door (three hinges per door maximum or one continuous hinge) as follows (Fig. X2.1):

$$P = \frac{W(c.g.)}{2Y} \tag{X2.1}$$

where:

P = lateral load at the top and bottom hinges (equal in magnitude, opposite in direction),
W = total weight of test door (plus any additional weights added) or weight of any standard size door,
$c.g.$ = center of gravity of test door (including weights) or standard size door, and
Y = spacing location from center of rotation to top and bottom hinge on test door of standard door assembly.

X2.2 Calculate the lateral load at the top and bottom hinge of any oversized door assembly or test door (4 hinges per door) as follows (Fig. X2.2):

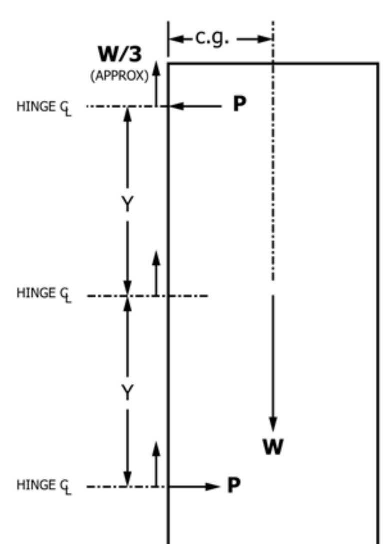


FIG. X2.1 Forces Acting on Standard-Size Door

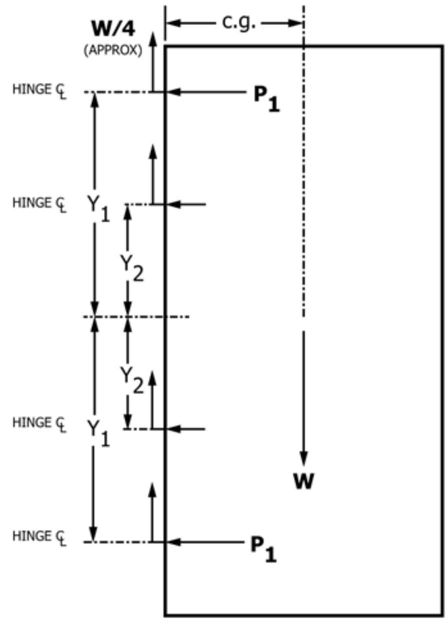


FIG. X2.2 Forces Acting on Oversized Door

$$P_1 = \frac{W(c.g.)}{2(Y_1^2+Y_2^2)} Y_1 \quad (X2.2)$$

where:

P_1 = lateral load at the top and bottom hinges (equal in magnitude, opposite in direction),

W = total weight of test door (plus any additional weights added) or weight of any oversized door,

$c.g.$ = center of gravity of test door (including weights) or oversized door,

Y_1 = location from center of rotation to hinge farthest away, and

Y_2 = location from center of rotation to closest hinge.

X2.3 Calculate the lateral load when a continuous hinge is used as follows:

$$P_1 = \frac{W(c.g.)}{2(Y_1^2+Y_N^2)} \quad (X2.3)$$

where:

Y_N = the location of each theoretical hinge point from the top of the hinge (at Y_1) to the closest hinge point to the center of gravity of the door (at Y_N). The dimensions and number of hinge points shall be determined by the proper engineering evaluation of the continuous hinge's mounting hole layout and knuckle design.

X2.4 Eq X2.1 and Eq X2.2 can be derived through the study of statics by summing the moments. Out of plane forces are ignored.

X2.5 Eq X2.2 can be expanded to develop a similar relationship with a continuous hinge.

X3. RELATED STANDARDS

X3.1 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.

X3.2 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.

X3.3 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.

X3.4 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.

X3.5 Titles of related standards indicated above pertain to performance objectives for the primary component or assembly. This is explained further in examples below.

X3.6 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.

X3.7 *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.

X3.8 *Test Methods* F1592:

X3.8.1 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.

X3.8.2 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.

X3.8.3 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.

X3.9 *Complementary/Dual Certifications*:

X3.9.1 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.

X3.9.2 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

X3.10 *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.

X3.11 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.