Proposed BHMA A156.37-20xx

STANDARD

FOR

MULTIPOINT LOCKS

SPONSOR

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION, INC.

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AMERICAN NATIONAL STANDARD

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FOREWORD (This Foreword is not a part of ANSI/BHMA A156.37)

The general classification of builders hardware includes a wide variety of items which are divided into several categories. This Standard is a result of the collective efforts of members of the Builders Hardware Manufacturers Association, Inc. who manufacture this product. The total Product Standards effort is, therefore, a collection of sections, each covering a specific category of items.

Performance tests and, where necessary, material and dimensional requirements have been established to ensure safety and stability to which the public is entitled. There are no restrictions on design except for those dimensional requirements imposed for reasons given above.

This Standard is not intended to obstruct but rather to encourage the development of improved products, methods and materials. The BHMA recognizes that errors will be found, items will become obsolete, and new products, methods and materials will be developed. With this in mind, the Association plans to update, correct and revise these Standards on a regular basis.

In most cases, products have been described in grade levels related to performance. Choice of grade and specific product are to be made on the basis of utility, aesthetics, security objectives and end use desired.

Users of this Standard consult applicable local building codes as to requirements affecting the functions of locks used on fire doors and doors within a mean of egress.

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1. SCOPE

1.1 This Standard establishes performance requirements for Multipoint Locks and includes operational tests, cycle tests, strength tests, security tests, and finish tests.

1.2 Tests described in this Standard are performed under laboratory conditions. In actual usage, results vary because of installation, door and frame construction, maintenance and environmental conditions.

1.3 **Grade Qualifications** (Also See Appendix A.) Manufacturers shall indicate the Grade level of their locks. Locks passing all tests within Sections 7, 8, 9 and 11 shall be assigned the respective Operational Grade; locks passing all the tests within Section 10 shall be assigned the respective Security Grade. It is permissible to qualify a model to an Operational Grade only; models meeting both Operational and Security Grades shall indicate the Grade Level for each.

2. DEFINITIONS

2.1 **Armored Strike** A strike reinforced in such a way as to strengthen the frame to which it is applied.

2.2 **Auxiliary Lock** A lock having a latch bolt or dead bolt operated by a key, paddle and/or turn, and usually used in addition to a primary lock or latching device.

2.3 **Backset** The distance from the edge of the door measured at the centerline of the door thickness to the centerline of the function holes or cross bore.

2.4 **Bitting** 1. the number(s) which represent(s) the dimensions of the key, 2. the actual cut(s) or combination of a key

2.5 **Biometric Readers** Optical, Capacitive, Sound Energy, And Heat Sensitive Readers for decoding unique biometric features, including fingerprints, eye, facial, or speech recognition.

2.6 **Bolts**

2.6.1 **Auxiliary Dead Latch** An actuator which automatically locks a projected latch bolt against return by end pressure.

2.6.2 **Dead Bolt** A lock component having an end, which protrudes from, or is withdrawn into, the lock front by action of the lock mechanism. When the door is closed and the dead bolt thrown, it extends into a hole provided in the strike, locks the door, and does not retract with end pressure.

2.6.3 **Latch Bolt** A lock component having a beveled end which projects from the lock front in an extended position, but is forced back into the lock case by end pressure or drawn back by action of the lock mechanism. When the door is closed, the latch bolt projects into a hole provided in the strike, and holds the door in a closed position.

2.6.4 **Deadlocking Latch Bolt** A spring actuated latch bolt with a beveled end and incorporating an actuator which, when depressed, automatically locks the projected latch bolt against return by end pressure. Also called dead latch.

2.6.5 **Expanding or Interlocking Type Dead Bolt** A bolt which interlocks with its strike when fully engaged.

2.6.6 **Deadlocking Latch Bolt Actuator** A component of the latch bolt which, automatically locks a projected latch bolt against return by end pressure.

2.7 **Bored Lock Series 4000** A lock installed in a round bored opening in the edge and face of a door.

2.8 **Cam** 1. a lock or cylinder component which transfers the rotational motion of a key or cylinder plug to the bolt works of a lock, 2. the bolt of a cam lock.

2.9 **Card Readers** Insertion or swipe credit-card readers decode magnetic stripes and smart cards

(memory cards and chip cards).

2.10 **Case** The housing of a lock.

2.11 **Contact Memory Readers** Electrical contact readers decode embedded EEROM chips and "touch memory" modules.

2.12 **Credential** A key, keycard, electronic key fob, PIN (personal identification number), biometric attribute, or other device, used in contact or proximity of the input device to transfer a code required for unlocking the locking device, or communicating with it for other access control purposes.

2.13 **Cylinder** The subassembly of a mechanical lock containing a plug with keyway and a body with movable detainers.

2.14 **Cylinder Body** The portion of a cylinder that surrounds the plug and contains the tumbler mechanism. The cylinder body is sometimes called a cylinder shell.

2.15 **Cylinder Guard** That portion that surrounds the otherwise exposed portion of a cylinder to protect the cylinder from wrenching, cutting, pulling or prying.

2.16 **Cylinder Housing** The portion of a mechanical lock that surrounds and retains the cylinder body. It is often part of a lock itself.

2.17 **Cylinder Plug** A component of the cylinder within the body, which is actuated when the correct key is used.

2.18 **Electrified Input Devices** The electrified locks equivalent to a cylinder for reading a credential and transmitting the "key code" to the controlling device. Examples include card readers, keypads, contact memory key readers, radio frequency (proximity) readers, optical readers, and biometric readers.

2.19 **Handleset** A handle with a thumbpiece.

2.20 **Indicator Button** The component of a hotel guest room lock which indicates on the outside that the dead bolt has been projected.

2.21 **Input Devices** Electrified input devices and push button mechanism.

2.22 **Interconnected Lock** A mechanically interconnected locking mechanism having a separate latch bolt or dead locking latch bolt and dead bolt designed for installation in round bored openings in the edge and face of a door. A single operation retracts all bolts.

2.23 **Interchangeable Core (IC)** A cylinder that is removed from the lock with a designated key.

2.24 **Interchangeable Core (IC) Mortise Cylinder** The combination of a mortise IC housing, integrated with a corresponding interchangeable core cylinder.

2.25 **Interchangeable Core (IC) Rim Cylinder** The combination of a rim cylinder IC housing, integrated with a corresponding interchangeable core cylinder.

2.26 **Key** A properly combinated device specifically intended to operate a corresponding cylinder.

2.26.1 **Display Key** A key for guest rooms used as sample rooms or when extra security is required. This key locks a single guest room against other keys except emergency or shutout key.

2.26.2 **Emergency Key** A key that operates all guest room locks even when locked from the inside.

2.26.3 **Emergency Release** The component of a privacy, bedroom or bath lock receiving a blank key or other device which when actuated enables entry from the outside.

2.27 **Keypads** Membrane or switch input readers decode digital pin codes mechanically entered.

2.28 **Keyway** The slot or hole in a cylinder plug within which a key is fully inserted to operate the cylinder.

2.29 **Locked** Locked is when the dead locking latch bolt or dead bolt or both cannot be retracted by operating the outside lever or knob.

2.30 **Lock Front** A plate fastened to the edge of a door through which the bolts pass.

2.31 **Loiding** Insertion of a piece of celluloid or other shim material between the door and the jamb at the latch bolt location to attempt forcible retraction of the latch bolt.

2.32 **Mechanical Pushbutton Mechanism** Decodes the input and releases a control shaft to activate the lock drive mechanism.

2.33 **Mortise Cylinder** A threaded cylinder, regularly supplied with a cam to actuate the lock mechanism.

2.34 **Mortise Lock or Latch** A lock or latch fitting into a mortised cavity prepared in the edge of a door. The bolts are operated by knobs, levers, turns, thumb pieces, paddles or cylinders engaging the mortise lock or latch through holes prepared in the faces of the door.

2.35 **Movable Detainer** Part of the mechanism of the cylinder which first should be moved by the key into a predetermined position before the key or plug can release. Examples include components known as pins, side bars, discs, and the like.

2.36 **Multipoint Lock** A mechanical locking system which engages the door frame with bolts, latches or other fastening devices at two or more locations, and which is not an exit device (per A156.3), interconnected lock (per A156.12), or mortise lock (per A156.13).

Multipoint Lock Primary Bolts Bolts which engage as a result of closing the door.

Multipoint Lock Secondary Bolts Bolts which engage as a result of secondary action after the door is closed.

2.37 **Narrow Stile** An extruded, aluminum door & frame component used in aluminum & glass entrance systems. These narrow stile components are typically 1-3/4”thick x 2” wide and require hardware designed for these applications.

2.38 **Narrow Stile Multi Point Lock** A multipoint lock designed to fit and operate in narrow stile applications

2.39 **Optical Readers** Single or bi-directional readers employing optical sensors for decoding visible credentials (bar codes and diagrams) or infrared serial transmissions.

2.40 **Paddle** The component that projects or retracts a dead bolt or latch bolt by pushing or pulling.

2.41 **Preassembled Lock Series 2000** A lock fitting into a notched cutout in a door.

2.42 **Push Button Mechanism** A mechanical coding device used in place of a key and cylinder.

2.43 **Radio Frequency Readers** Single or bi-directional readers employing antennas for decoding contactless RFID tags and proximity badges.

2.44 **Recessed Cylinder** A cylinder where the cylinder head is flush with, or recessed below, the outside surface of the trim to protect the cylinder from wrenching, cutting, pulling or prying.

2.45 **Rim Cylinder** A cylinder typically used with surface applied locks and attached with a back plate and machine screws. It has a tailpiece to actuate the lock mechanism.

2.46 **Rim Lock** A lock mounted on the inside face of a door.

2.47 **Strike** A mortised or surface mounted plate fastened to the door frame into which the bolts project.

2.48 **Strike Box** A housing used in back of a strike to enclose the bolt or bolt openings.

2.49 **Tailpiece** A bar projecting from the back of a rim, bored lock cylinder or a push button mechanism engaging the lock mechanism and when rotated by the key or turn either locks or unlocks the lock.

2.50 **Turn** The component that projects or retracts a dead bolt or latch bolt by turning. Sometimes called a turn piece or thumb

2.51 **Thumbpiece** A lever, projecting from a handle, pressed by the thumb to retract a latch bolt.

3. GENERAL

3.1 **Cylinders and Input Devices for Locks** Cylinders supplied or mated with locks shall meet the performance requirements for the appropriate cylinder types and grade level found in the ANSI/BHMA Standard A156.5-2010 for Cylinders and Input Devices for the lock to retain its grade listing. Assemblies take the grade level of the lowest graded component. Other mechanisms are permitted to be used in lieu of cylinders providing the performance and security criteria are equivalent to that of cylinders. Suffix D shall be indicated in the certified products directory for locks to be used only with drill resistance cylinders as evaluated in A156.5.

3.2 **Tolerances** Where only minus tolerances are given, the dimensions are permitted to be exceeded at the option of the manufacturers. All values which do not carry specific tolerances or are not marked maximum or minimum shall have the following tolerances: Linear dimensions shall be ± 1/16 in. (1.6 mm). Pounds or pound force shall be ± 2%. Degrees shall be ± 2 degrees.

3.3 Where levers are referenced, knobs, paddles, or handlesets are permitted to be used, except for tests which apply to specific trim.

3.4 Roses, escutcheons, knobs, levers, turns, paddles, and cylinder guards shall cover all door preparation openings.

3.5 No lock can provide complete security by itself. Locks may be defeated by forcible or technical means, or evaded by entry elsewhere on the property. No lock can substitute for caution, awareness of your environment, and common sense. Builders hardware is available in multiple performance grades to suit the application. In order to enhance security and reduce risk, consult a qualified locksmith or other security professional. For applications where pick resistance and other higher security protections are required users should consider locks meeting UL 437 or ANSI/BHMA A156.30 for High Security Cylinders.

3.6 **Reference to other Standards** Referenced standards are available from www.buildershardware.com, www.ansi.org, www.astm.org, and www.ul.com.

3.7 **Values** Required values in this Standard are given in US units. The SI (metric) equivalents are approximate.

3.8 **Dead Latching** When any function of a lock combines a dead bolt and auxiliary dead latch, the auxiliary dead latch shall be effective whenever the dead bolt is projected or the outside lever or knob is locked.

3.9 **Codes** Certain lock functions are not permitted on doors within a means of egress. Consult local Authority Having Jurisdiction. When locks and latches are used in fire door assemblies, they shall be listed for use in fire doors by a Nationally Recognized Testing Laboratory (NRTL) and shall be under an in-plant follow-up inspection service.

4. DESCRIPTION AND FUNCTION NUMBERS

Due to the variety and complexity of Multipoint Lock designs, this standard does not offer type numbers and function descriptions typical of other BHMA Standards. Please consult individual manufacturer's catalogs for specifying information. Multipoint Locks meeting this standard shall pass all the applicable tests as described in each section.

5. GENERAL TEST PARAMETERS

5.1 Lubrication shall not be applied at any time during the tests.

5.2 Failure of the test fixture does not constitute pass or failure of the tests.

5.3 **Mounting locks** The test equipment shall permit installation of the complete lockset with trim in accordance with the manufacturer's recommendations as described in the template and instruction sheets regularly furnished. Unless otherwise specified, locksets shall be properly mounted in accordance with the manufacturer's instructions. The lock front-to-strike spacing shall be 1/8 in. +/- 1/32 (3.2 +/- 0.8 mm) at centerline of bolt for all tests. Where specified within this Standard, use the manufacturer's supplied strike and mounting instructions.

5.4 **Test Cylinders** Cylinders used for testing, shall have certification per ANSI/BHMA A156.5-2010 for Cylinders and Input Devices for Locks. For cycle testing, at the manufacturers discretion, the moveable detainers are allowed to be removed.

5.5 **Standard Test Methods for Security of Swinging Door Assemblies** Some of the test equipment, fixtures and strength tests required in this Standard are taken from ASTM F476-84 (2002). Descriptions of the test equipment, fixtures and strength tests required have been incorporated by reference to the specific paragraph numbers found in ASTM F476.

5.6 Tests shall be made using standard locksets. Complete instructions and templates shall be included. Failure of any one lock in any of the tests shall constitute failure of the complete qualification tests.

5.7 Testing shall be performed on combinations of engagement points necessary to fully evaluate the product. Due to the wide range of designs and terms for engagement points in this product, where tests describe "latches", or "bolts" etc., the test shall be applied to all applicable points, unless otherwise specified.

5.8 **Sample Test Locks**

Operational and Cycle Tests	Strength Tests	Finish Tests (per Finish)	Security Tests
3 Lock Samples	3 Lock Samples	1 Sample	11 Lock Samples

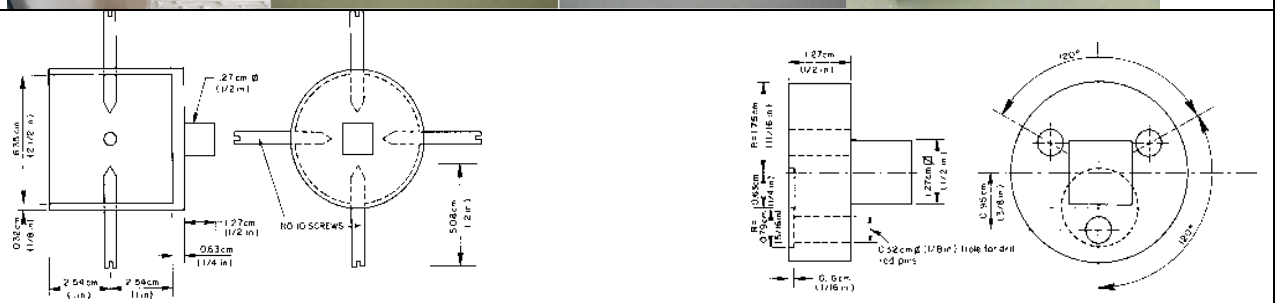
5.9 **Measuring Equipment** All instruments and equipment used to conduct tests for recording data need to be calibrated and maintained for effectiveness and continued accuracy. Calibration of equipment shall be traceable to the National Institute of Standards and Technology (NIST). The frequency of calibration depends on the recommendation of the particular test equipment manufacturer with a minimum being once per year. Measuring equipment used shall have a known measurement error and be capable of qualifying the value being measured.

5.10 Functions with Keyed *Inside* Locked Trim are subject to the same tests as Locked Outside Trim unless otherwise specified. Use separate samples.

6. TEST EQUIPMENT AND FIXTURES

6.0 As agreed to by the manufacturer and test lab, modified or equivalent equipment is permissible, provided the evaluation and results per the respective test descriptions are not affected.

6.1 **Examples of Torque Applicators**



6.2 **Mechanically Operated Cycle Test Apparatus**

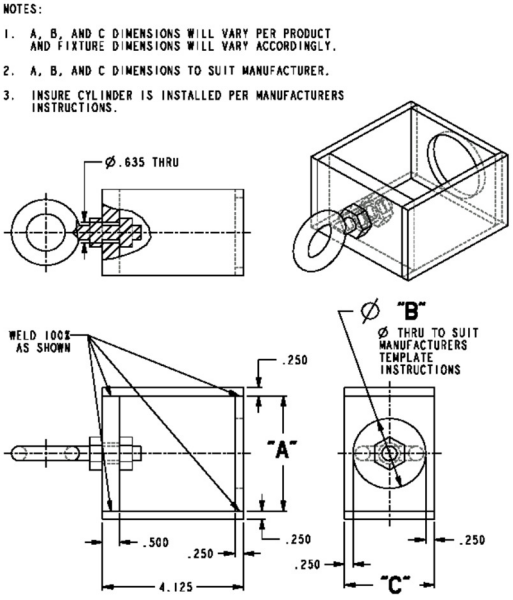
A mechanically operated test door or panel with a minimum height of 84 in. (2134 mm) and a minimum width of 36 in. (915 mm) simulating the normal operation of the device. The test apparatus shall allow performance of the qualification tests without removing the sample.

6.3 **Strength Testing Apparatus** An operable test door or panel shall be provided that allows the multipoint device to be tested at its full size. The test rig shall be designed to withstand the required loads while allowing for engagement in the frame or floor, with or without strikes as required by the manufacturer's installation instructions.

6.4 **Security Test Equipment**

6.4.1 **Cylinder Guard and Escutcheon Pulling Devices ASTM F476 paragraph 5.1.5**

Cylinder Guard Pulling Fixture



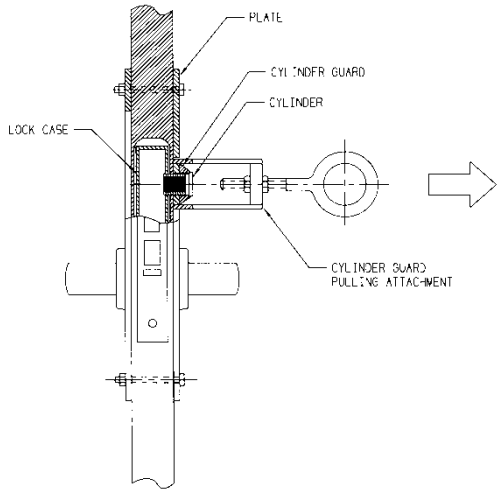
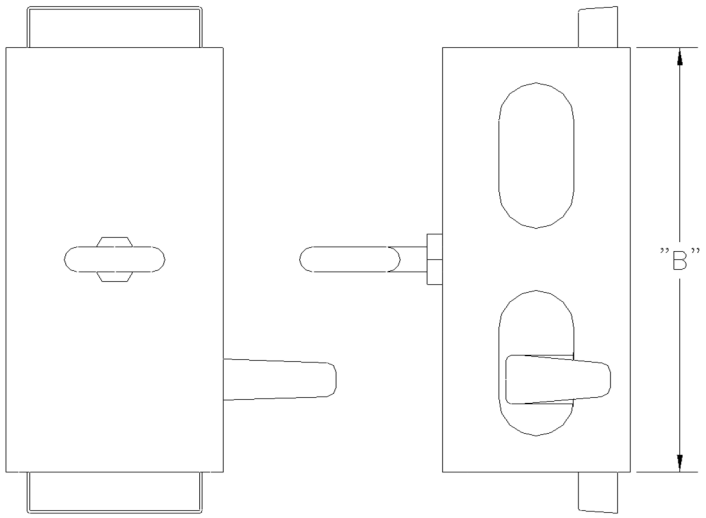
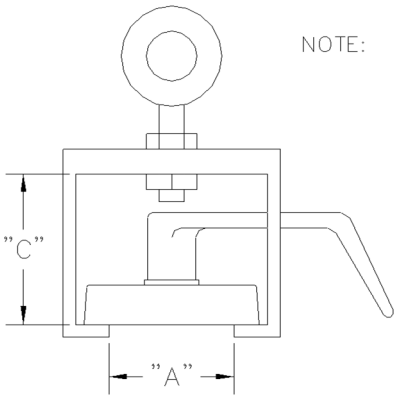


FIGURE 3
CYLINDER GUARD OR ESCUTCHEON PULLING ATTACHMENT
(SEE 10.3)
DIMENSIONS (inches [mm])

6.4.2 **Lock Body or Housing Tension Fixture**

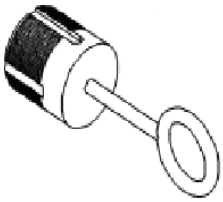




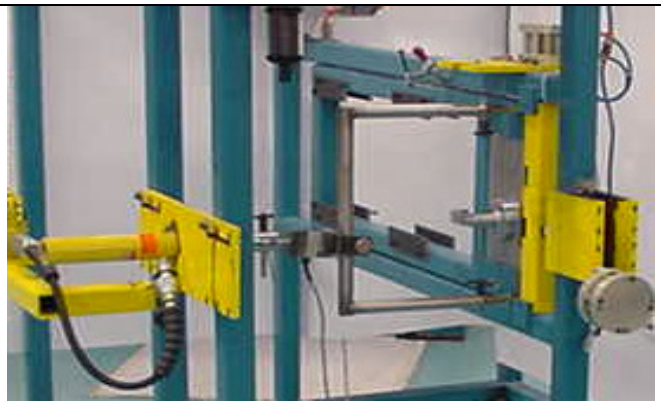
NOTE: "A" DIM TO SUIT MFG.
"B" DIM TO SUIT MFG.
"C" DIM TO SUIT MFG.

PULL FIXTURE EXPENDABLE MOUNTING BLOCK INSERT DRILLED AND MORTISED PER MANUFACTURERS TEMPLATE TO RECEIVE LOCK AND RECESSED TO ACCOMODATE THICKNESS OF PULLING DEVICE.

6.4.3 **Cylinder Tension and Torque Applicators**

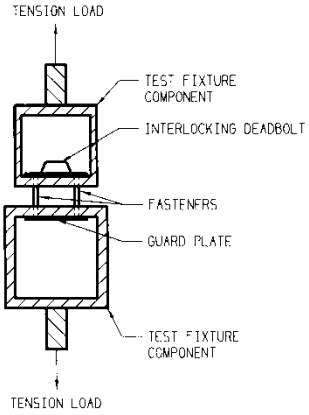


6.4.4 **Lockset Tension Test Apparatus**



6.4.5 **Tension Loading Fixture**

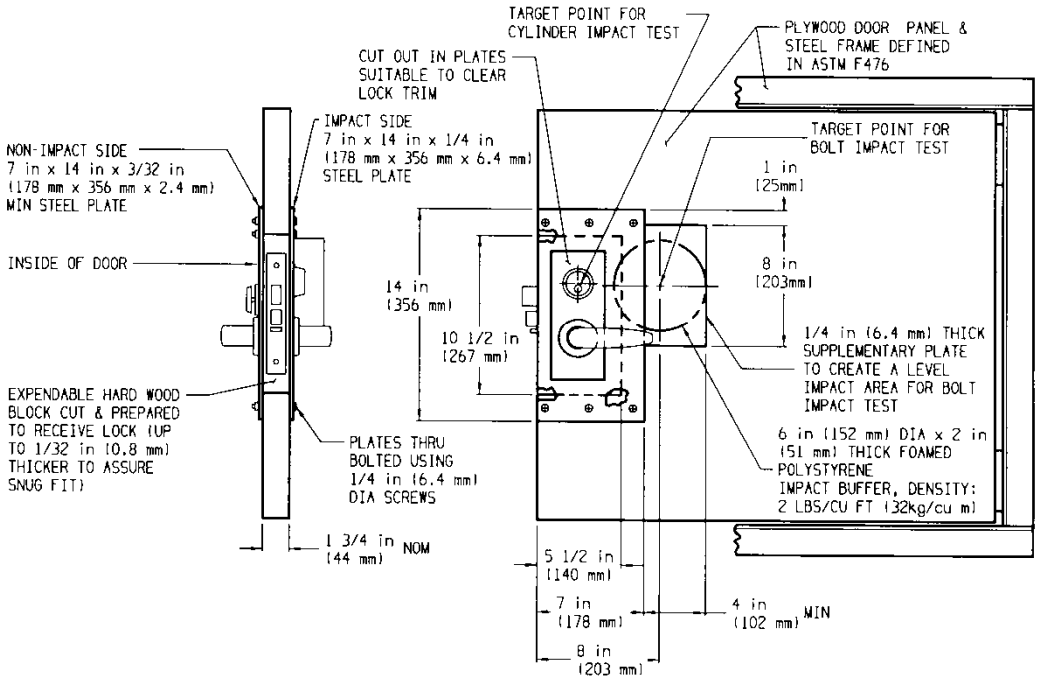
To deliver and measure tensile forces up to a 12,000 lbf (53,375 N).

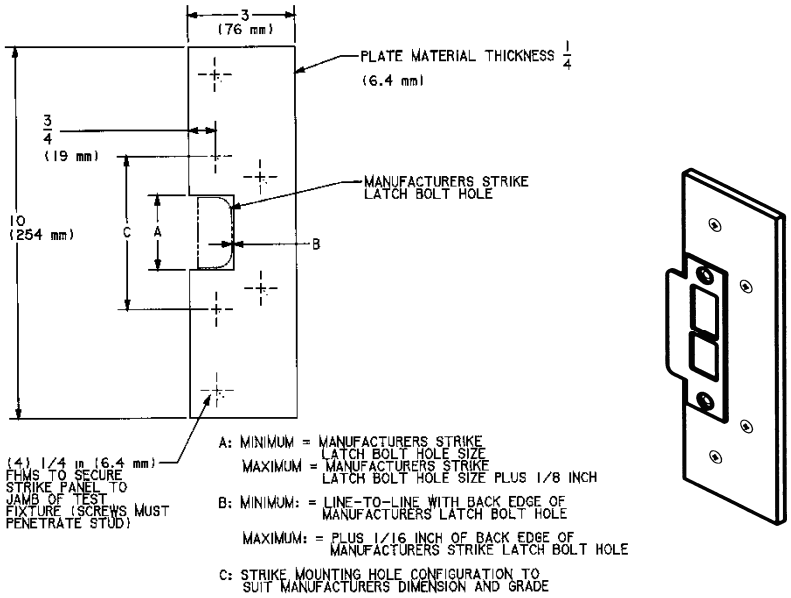


Security Test Equipment (cont.)

6.4.6 **Impact Test Equipment**

See ASTM F476, paragraphs 6 and 8. The fixture is permitted to be increased in size up to 36 in. (915 mm) square or as shown below**.** Strike attachment shall be as shown below; where wood screws are specified a hardwood equivalent is acceptable. It may be modified to allow strike attachment simulating the manufacturer's mounting instructions provided the cutaway feature is maintained subjecting the strike and fasteners to the full test load. A recessed attachment is not permitted to remove the load from the strike.





6.4.7 **Vertical Impactor Pendulum System ASTM F476 FIG. X1.6**	6.4.8 **Component Ram ASTM F476 paragraph 5.1.2**	6.4.9 **Door Ram ASTM F476 FIG. X1.2**
		

7. OPERATIONAL TESTS

7.0 Operational tests, unless otherwise specified, shall be performed on locksets installed per the manufacturer's instructions including specified strikes, using either the Strength Test or Cycle Testing Fixtures. Tests shall be performed with the maximum number of bolts projected. Multiple operations to retract latches are permitted for product designs intended to be used in residential applications; consult applicable building codes.

7.1 **Force to Retract Unloaded Bolts**

7.1.1 **By Turn** A torque measuring device shall be applied to the turn at the axis of the turn and slowly rotated until the bolt(s) are withdrawn to within 1/8 in. of the lock front. When the lock construction permits operation in both clockwise and counterclockwise directions, repeat in the opposite direction.

7.1.2 **By Key** A torque measuring device shall be applied to the key and slowly rotated until the bolt(s) are withdrawn to within 1/8 in. of the lock front; or the locked lever is released to allow retraction by lever. When the lock construction permits operation in both clockwise and counterclockwise directions, repeat in the opposite direction.

7.1.3 **By Lever or Knob** A torque measuring device shall be applied to the lever and slowly rotated until the bolt(s) are withdrawn to within 1/8 in. of the lock front; When the lock construction permits operation in both clockwise and counterclockwise directions, repeat in the opposite direction.

7.1.4 **By Paddle** A force meter shall be applied to the **outside** paddle in the direction of the opening swing of the door 1 in. (25.4mm)±1/32 in. (.8mm) from the free end of the paddle on the centerline, retracting the dead bolt or latch bolt or both to within 1/8 in. of the lock front.

7.1.5 **Requirements** Maximum. Applicable to any lock operation which can be performed, any or all bolts, and in any order.

Turns All Grades	12 lbf-in. (1Nm)
Keys All Grades	12 lbf-in. (1Nm)
Levers Grade 1	28 lbf-in. (3.1 Nm)
Levers Grade 2	36 lbf-in. (4.0 Nm)
Levers Grade 3	45 lbf-in. (5.0 Nm)
Knobs All Grades	12 lbf-in. (1 Nm)
Paddles	40 lbf (178N)

7.2 **Force to Latch Door**. Perform with all primary bolts engaging. Apply a force meter perpendicular to the face of the door to a point 1 in. (25.4 mm) from the lock edge of the door 40 in. from the bottom of the frame, when the door is open just within ¼ in. (6.4mm) of the latch bolt contacting the lip of the strike. Close the door slowly by pushing the force meter against the door until the bolt(s) fully enter the strike opening. The maximum measured force to fully latch the door shall not exceed the maximum specified.

Requirements Maximum

All products, any and all latch points	4.5 lbf (20 N)

7.3 **Minimum Projection of Latch Bolt(s) when depressed to dead locked position.**

Use no strike and either mount. Perform on each deadlocking latchbolt. The starting bolt projection shall be 1/2 in. +/- 1/16 in. (12.7 mm). Completely depress the deadlocking latchbolt actuator and then depress the bolt to the deadlocked position. Measure the projection of the depressed bolt from the centerline of the lock front to the end of the bolt. The measured projection shall not be less than the minimum specified.

Requirements Minimum

Grade 1	11/32 in. (8.7 mm),
Grades 2 & 3	Grade 2 & 3: 1/4 in. (6.4 mm)

7.4 **Minimum Projection of Deadlocking Latchbolt Actuator(s) to Deadlock Latch Bolt(s).** Use no strike and either mount. Perform on each deadlocking latchbolt. Depress the deadlocking latchbolt actuator to the specified dimension from the centerline of the lock front and test the latch bolt for deadlocking. Lack of deadlocking constitutes failure.

Requirements Minimum

All Grades	7/32 in. (5.6 mm) ± .005 in.

7.5 **Force to Retract Preloaded Bolt. (Warped Door)** Perform per 7.1 while a 50 lbf (222 N) is applied perpendicular to a point 40 in. (1020 mm) from the floor or to the centerline of the vertical axis of the test apparatus not to exceed 40 in. (1020mm), approximately 3 in. (76 mm) from the lock edge of the door.. The 50 lbf (222 N) shall load the bolt(s) against the strike(s) in the direction of opening the door and be sustained throughout the test. The maximum measured torque or force to retract the bolt(s) to clear the strike(s) without contact shall not exceed the maximum specified.

Exception: For Narrow Stile Deadbolts the load shall be 30 lbf (133N). The torque to retract the bolt shall not exceed the value specified below:

The 50 lbf (222 N) shall load the bolt against the strike in the direction of opening the door

Requirements Maximum All Grades

	Any or all bolts
Turns	33 lbf-in. (3.7 Nm)
Keys	33 lbf-in. (3.7 Nm)
Levers	70 lbf-in. (8 Nm)
Knobs	45 lbf-in. (5 Nm)
Paddles	65 lbf (290N)

8. STRENGTH TESTS

Note: Perform all of the strength tests in order on each of the three samples prior to performing the qualification tests in 8.6. The lock shall remain in the same mount and not be repositioned, adjusted, operated or manipulated throughout the Strength Tests.

8.1 **Axial Load Test** Intended to test strength of the trim attachment to the door. With the door blocked, apply a load dynamometer to the **outside lever,or knob,** along axis, perpendicular to the face of the door. Repeat to the **inside lever or knob**. **For paddles,** apply a load dynamometer to the **outside** paddle at the axle and 2 in. (51 mm) from the pivoting axle perpendicular to the face of the door to load the door against the stop to the load specified. Any trim limiting access to the axle may be removed for test.

Requirements

Grade 1	Grade 2	Grade 3
500 lbf (2300 N)	300 lbf (1350 N)	250 lbf (1120 N)

8.1.1 Apply a load dynamometer to the **outside lever** 2 in (51.4 mm) from the spindle centerline perpendicular to the face of the door. Repeat to the **inside lever**.

Requirements

Grade 1	Grade 2	Grade 3
200 lbf (889 N)	150 lbf (667 N)	100 lbf. (444 N)

8.2 **Vertical Load Test** Apply a force meter vertically to the **outside** lever, knob or paddle. The paddles shall be tested, one mounted in the horizontal position and a second in the vertical position. Apply the load at 1 1/2 in. (38mm) ± 1/16 in. (1.6 mm) from the face of the door or the equivalent bending moment perpendicular to the paddle in the vertical position, lever or knob axis to the load specified. With the paddle in the horizontal position, the load or the equivalent bending moment shall be applied parallel to the paddle axle. Repeat to the **inside** lever, knob or paddle.

Requirements

	Grade 1	Grade 2	Grade 3
Knobs/Levers /Paddles	360 lbf (1600 N)	250 lbf (1120 N)	150 lbf (667 N)

8.3 **Locked Torque Test** This test is intended to assure lock operation and security are maintained following application of a moderate torque. Exception: If torque values listed cannot be reached after one full revolution because of security design features and the lock remains locked after torque has been applied, the requirements of operational tests 7.1, 7.2, and 7.3 shall still be met. Apply the required torque load to the **locked lever**.

Requirements for Levers

Grade 1	Grade 2	Grade 3
700 lbf-in (74 Nm)	450 lbf-in (50 Nm)	225 lbf-in (25 Nm)

8.4 **Bolt Strength Test** This test is intended to assure the bolt(s), and unsupported strike(s) can withstand a large static load. The test shall evaluate two conditions, with the primary latching engaged, and with both the primary and the secondary locking bolts engaged. Where all bolts are thrown with all operations, the higher values apply. Apply a load perpendicular to the face of the test door at a point 1 in. (25.4 mm) from the lock edge of the door and in the direction of opening the door while the bolt(s) are engaged in their respective openings. The test rig shall be designed to withstand the required loads while allowing for engagement in the frame or floor, with or without strikes as required by the manufacturer's installation instructions. The loading shall be gradually increased to the loads specified. Failure of the bolt(s) or strike(s), including fasteners, constitutes failure of the test.

Requirements (primary latching point[s] only)

Grade 1	Grade 2	Grade 3
1,200 lbf (5,300 N)	800 lbf (3,700 N)	600 lbf (2,700 N)

Requirements All except narrow stile (primary plus secondary, or all always thrown latching point[s])

Grade 1	Grade 2	Grade 3
1,350 lbf (6,000 N)	1,125 lbf (5,000 N)	675 lbf (3,000 N)

Requirements Narrow stile only

Type Latch	Grade 1	Grade 2	Grade 3
Dead bolt	1,800 lbf (8000 N)	900 lbf (4000 N)	675 lbf (3000 N)
Latch bolt	--	800 lbf (3600 N)	600 lbf (2700 N)

8.5 **Latch Bolt End Pressure Test** Test all deadlocking latch bolts, in accordance with ASTM F476, paragraph 10 Static Bolt Load Test, except plunger depth is 7/32 not ¼. The latch bolt shall not depress below 1/4 in. (6.5 mm).

Requirements Latch Bolt End Pressure

Grade 1	Grade 2	Grade 3
150 lbf (670 N)	100 lbf (440 N)	75 lbf (330 N)

8.6 **Qualification Requirements** Upon completion of Strength Tests, the lever shall not deflect more than 3/8 in (10 mm) at the end of the lever nor touch the door when a 25 lbf (111 N) load is applied 2 in (51 mm) from the center-line of the spindle perpendicular to the door surface. The test locks shall then be subject to Operational Tests as below. Locks shall operate per the applicable functional descriptions. The lock shall not be repositioned in the mounting prior to the qualification test.

8.6.1 **Requirements:** Torque or Force to Retract Bolt

Levers Gr 1	Levers Gr 2	Levers Gr 3	Knobs	Keys and Turns	Paddles
28 lbf-in. (3.1 N-m)	36 lbf-in. (4 N-m)	45 lbf-in. (5 N-m)	12 lbf-in. (1 N-m)	12 lbf-in. (1 N-m)	40 lbf (178 N)

8.6.2 **Requirements** Deadlatching Projection

Grade 1	Grade 2	Grade 3
17/64 in. (7 mm)	13/64 in. (5.1 mm)	13/64 in. (5.1 mm)

8.6.3 **Requirements** Force to Retract Preloaded Bolt

	Any or all bolts
Turns	33 lbf-in. (3.7 Nm)
Keys	33 lbf-in. (3.7 Nm)
Levers	70 lbf-in. (8 Nm)
Knobs	45 lbf-in. (5 Nm)
Paddles	65 lbf (290N)

9. CYCLE TESTS

9.1 Install samples per manufacturer's instructions. To facilitate timing of the cycle test, the deadbolt strike is permitted to be removed, provided the specimen is checked for full retraction to 1/8 inch. Failure occurs when the deadbolt does not retract to within 1/8 inch. A test load shall be applied to the test door. The test load is intended to simulate a door closer. The test load shall meet the requirements of Table 9.3. The test load shall be applied perpendicular to the test door at a point 40 in. (1020 mm) from the floor or to the centerline of the vertical axis of the test apparatus not to exceed 40 in. (1020mm) and approximately 3 in. (76 mm) from the lock edge of the door.

Test Cycle definition:

1. Operate the lever, knob, or thumb piece to fully retract all bolts out of their strikes.
2. Pull on the lever, knob or handle to open the door without allowing the bolts to contact their strikes.
3. Release the lever, knob or thumb piece.
4. Close the door to engage all Primary Bolts by means of a door closer or other suitable device.
5. Operate the lever, knob or thumb piece to engage all Secondary Bolts per the requirements of 9.3.

9.2 Use samples which successfully passed Operational Tests 7.1 through 7.5.

9.3 This test is intended to simulate repetitive use under normal operating conditions. Cycle testing shall be performed using the interior trim. Locksets shall be tested to the values in Table 9.3.

Table 9.3 Cycle Requirements, Load Requirements and Test Sequence

Mode	Grade 1	Grade 2	Grade 3
Cycle all bolts including secondary	125,000	75,000	50,000
Cycle primary bolts only	275,000	125,000	50,000
Perform Qualification Tests per 9.4			
Cycle all bolts including secondary	125,000	75,000	50,000
Cycle primary bolts only	275,000	125,000	50,000
Total Cycles	800,000	400,000	200,000
Load	10 lbf (44 N)	5 lbf (22 N)	none

9.3.1 **Knobs** The test apparatus shall apply the load to open the door to the knob centerline. The knob shall be cycled clockwise prior to the Qualification Tests, and counterclockwise following the Qualification Tests. **Unidirectional knobs** shall be cycled in one direction only until the total cycles have been met for the grade being evaluated. The cycle rate shall not exceed 30 cycles per minute (cpm).

9.3.2 **Levers** The test apparatus shall apply the load to open the door to the lever 2 in. (508 mm) from the spindle centerline perpendicular and away from the door. The cycle rate shall not exceed 30 cpm.

9.3.2 **Handlesets** shall be cycled without a load using the fixture shown. The cycle rate shall not exceed 30 cpm.

9.4 The cycle test shall be paused after 50% of the total required cycles. Repositioning and tightening of the lockset, strikes or trim is allowed during the test pause. The tested lockset shall be subjected to the applicable Operational Tests noted below, and cycle testing shall resume after successful completion of the applicable Operational Tests.

Paragraph	Description	Grade	Requirements
7.1	**Force to Retract Unloaded Bolts-Maximum**		
	By Turn	All Grades	14 lbf -in. (1.2 Nm)
	By Key	All Grades	14 lbf-in. (1.6 Nm)
	By Lever	Grade 1	34 lbf-in. (3.72 Nm)
	By Lever	Grade 2	45 lbf-in. (4.8 Nm)
	By Lever	Grade 3	54 lbf-in. (6 Nm)
	By Knob	All Grades	14 lbf- in. (1.62 Nm)
	Paddle	All Grades	48 lbf (214 N)
7.2	**Force to Latch Door**	All Grades	5.4 lbf (24 N)
7.3	**Minimum Projection of Bolt when Depressed to Dead latched Position**	Grade 1 2&3	17/64 in. (7 mm) 13/64 in. (5.1 mm)
7.4	**Minimum Projection of Auxiliary Dead Latch to Deadlock Latch Bolt**	Grade 1 2&3	1/4 in. (6.3 mm) 11/64 in. (4.5 mm)
7.5	**Force to Retract Preloaded Bolt-Maximum**	All Grades	
	By Turn		40 lbf - in. ()
	By Key		40 lbf - in. ()
	By Lever		84 lbf - in. (9.6 Nm)
	By Knob		54 lbf - in. (6 Nm)
	By Paddle		78 lbf (348 N)

9.5 **Cycle Test Continuation.** Complete the Cycle Test using the method described in paragraph 9.3.

9.6 **Performance After Cycle Test.** At the completion of the Cycle Test, locks shall operate.

10. SECURITY TESTS

10.0 **Failure Criteria** A different lock shall be tested for each security test. Failure consists of any damage that allows the door to be opened at the appropriate test level. Tests shall be performed with the device in the locked position. The lock shall not be operated from the inside during the tests. Where manipulation of the lock with a screwdriver is required, a maximum of five minutes testing time shall be allowed. The screwdriver shall be a commercially available type with a blade not exceeding 6 in. (150 mm) in length or 10 in. (250 mm) overall length. It is not intended that the screwdriver be used to attack the lock mount or fixture or cause further damage to the lock. Applicable tests in 10.3 through 10.6 are allowed to be waived when shown as limited to Suffix "D" cylinders.

10.1 **Knob, Lever or Paddle Vertical Impact Test** Prepare the test specimen in accordance with paragraph 6.5.6 and lock the door or test panel in the closed position. See ASTM F476, paragraph 12.1 for test method, except using the door or test panel described in 7.3. The paddles shall be tested, one mounted in the horizontal position and a second in the vertical position. Apply the load specified.

Requirements

Grade 1	Grade 2	Grade 3
75 lbf-ft. (100 J) 10 Blows	75 lbf-ft. (100 J) 5 Blows	75 lbf-ft. (100 J) 2 Blows

10.2 **Cylinder Guard (sectional trim), or Escutcheon Vertical Impact Test** Prepare the test specimen in accordance with paragraph 6.5.6 and then lock the door or test panel in the closed position. Position the vertical impactor so that the pendulum arm is horizontal when the striking weight contacts the top of the trim and its center of gravity is in the vertical centerline through the trim. Raise the impactor to 40 in. (1.0 m) above the top of the test specimen to deliver the required impact and release it. Deliver the required number of impacts to the trim (grazing or nearly grazing the mounting plate on the downswing). After each impact, manually attempt to withdraw the bolt from the strike by end pressure, and by manipulating any exposed lock mechanism by hand or with a screwdriver. This test is applicable only when the trim projects over 3/8 in. (9.5 mm) from the surface of the door.

Requirements

Grade 1	Grade 2	Grade 3
75 lbf-ft. (100 J) 10 Blows	75 lbf-ft. (100 J) 5 Blows	75 lbf-ft. (100 J) 2 Blows

10.3 **Cylinder Guard (sectional trim) or Escutcheon Tension Test** Lock the door in a closed position blocking the load from the bolt/strike interface. With the cylinder threaded to its normal installed depth, use a pulling attachment similar to that shown in 6.4.1 to apply the specified force behind the trim and pull perpendicular to the face of the door. Following the test, attempt to open the door by manipulating any exposed lock mechanism by use of a screwdriver. Manually test the primary deadlocking bolt for end pressure resistance to assure that it is deadlocked or dead latched. Any bolt whose retraction would cause the retraction of all bolts must pass the latch bolt end pressure test.

Requirements

Grade 1	Grade 2	Grade 3
3,600 lbf (16,000 N)	2,500 lbf (11,000 N)	1,000 lbf (4,400N)

10.4 **Lock Body or Housing Tension Test** Lock the door in a closed position blocking the load from the bolt/strike interface. Perform the test using a fixture or modified cylinder capable of delivering the required load and of the same interface configuration as an actual cylinder. Attach to a suitable tensile pulling device and apply the tension load specified. See 6.4.2. Following the test, attempt to open the door by manipulating any exposed lock mechanism by use of a screwdriver. Manually test the primary deadlocking bolt for end pressure resistance to assure that it is deadlocked or dead latched.

Requirements

Grade 1	Grade 2	Grade 3
3,600 lbf (16,000 N)	2,500 lbf (11,000 N)	1,000 lbf (4,400N)

10.5 **Lock Body or Housing Torque Test** Perform the test using cylinder of the same or higher grade than the lock being tested. Apply specified torque rapidly once in each direction without stopping, using a suitable device, and continue to attempt to achieve the required torque, making multiple revolutions as necessary. Following the test, attempt to open the door by manipulating any exposed lock mechanism by use of a screwdriver. Manually test primary deadlocking the latch bolt for end pressure resistance to assure that it is deadlocked or dead latched. Where the attempted torque cannot be achieved due to design features, the door cannot be opened, and other applicable requirements are met, the specimen passes.

Requirements

Grade 1	Grade 2	Grade 3
120 lbf-ft. (160 Nm)	80 lbf-ft. (110 Nm)	40 lbf-ft. (55Nm)

10.6 **Cylinder Guard, (sectional trim) or Escutcheon Torque Test** Lock the door in the closed position blocking the load from the bolt/strike interface. Use a gripping attachment and apply to the trim. Apply the specified torque level rapidly once in each direction without stopping, using a suitable device. If the cylinder, cylinder guard, or escutcheon is loosened, attempt to gain entry by use of a screwdriver or by hand. Test to the levels specified. Manually test the primary deadlocking latch bolt for end pressure resistance to assure that it is deadlocked or dead latched. Where the attempted torque cannot be achieved due to design features, the door cannot be opened, and other applicable requirements are met, the specimen passes.

Requirements

Grade 1	Grade 2	Grade 3
120 lbf-ft. (160 Nm)	80 lbf-ft. (110 Nm)	40 lbf-ft. (55 Nm)

10.7 **Locked Knob, Lever, or Paddle Test**

10.7.1 **Locked knob or lever**. Install the test specimen in accordance with paragraph 6.5.6 and lock the door or test panel in the closed position. See ASTM 476, paragraph 15.1 for test method. Failure shall occur if the door can be opened. Where the attempted torque cannot be achieved due to design features, the door cannot be opened, and other applicable requirements are met, the specimen passes. Apply the load specified.

10.7.2 **Locked paddle**. A force meter shall be applied to the **outside** paddle in the direction of the opening swing of the door 2 in. (51 mm) ±1/16 in. (1.6 mm) from the axle of the paddle retracting the dead bolt or latch bolt or both. Apply a force load to the locked outside paddle to that specified. Failure shall occur if the door can be opened.

Requirements

	Grade 1	Grade 2	Grade 3
Knobs Torque	120 lbf-ft. (160 Nm)	80 lbf-ft. (110 Nm)	35 lbf-ft. (47 Nm)
Lever Torque	175 lbf-ft. (240 Nm)	120 lbf-ft. (160 Nm)	55 lbf-ft. (75 Nm)
Paddle Force	675 lbf (3000N)	450 lbf (2000 N)	225 lbf (1000 N)

10.8 **Cylinder Face Impact Test**

Cylinder Face Impact Test Install the test specimen in accordance with 6.5.6 and lock the door or test panel in the closed position. If the function being tested has both a latch bolt and a dead bolt, both bolts shall be projected. Test per ASTM F 476 paragraph 17.1 test method except using the door or test panel described in 7.3. Without operating the lock, manually test the primary deadlocking bolt for end pressure resistance to assure that it is deadlocked or dead latched. Strike, fastener or bolt failure shall also be considered cause for failure.

Requirements

Grade 1	Grade 2	Grade 3
75 lbf-ft. (100 J) 10 Blows	75 lbf-ft. (100 J) 5 Blows	75 lbf-ft. (100 J) 2 Blows

10.9 **Multipoint Lock Impact Test** Install the test specimen in accordance with the manufacturers instructions in an 18 gage, 3 x 7 vertically stiffened hollow metal door with a 16 gage frame. Lock the door in the closed position with all bolts projected. See ASTM F476, paragraphs 21.1 and 21.2 for the test method (except door mounting as above). No readjustment of the lockset is permitted following application of force. Apply the impact specified to the door, at a height of 40 inches, approximately eight inches from the latch edge (missing the trim). In addition to meeting the 10.0 Failure Criteria, no gap shall result which would allow the passage of a three inch (76 mm) sphere.

Requirements (Testing on in-swing door qualifies out-swing installation)

Grade 1	Grade 2
5 blows of 150 lbf-ft. (200 J) at 40 inches from the floor (and 8 inches from the edge)	3 blows of 150 lbf-ft. (200 J) at 40 inches from the floor (and 8 inches from the edge)
5 blows of 150 lbf-ft. at 6 inches from the floor and edge	3 blows of 150 lbf-ft. at 6 inches from the floor and edge
5 blows of 150 lbf-ft. at 6 inches from the top of the door and edge	3 blows of 150 lbf-ft. at 6 inches from the top of the door and edge

10.10 **Dead Bolt Sawing Test** A primary deadlocking bolt shall resist sawing through for the time period specified in when fed into a band saw with a sustained 5 lbf (22N). The saw cut and the force shall be applied parallel to and not more than 1/16 in. (1.6 mm) from the lock front. The metal saw blade (not carbide) shall have the following commercial specifications: 1/4 in. (6.35 mm) wide, 0.025 in. (0.65 mm) thick, 14 teeth per 1 in. (25.4 mm) regular set and shall travel at 100 ft./min. ± 10 (0.51 m/s ± 0.05). A new blade shall be used for each test.

Requirements minimum

Grade 1 Narrow Stile	All Other Grades
30 Minutes	5 Minutes

10.11 **Bolt Compressive Load Test** Applies only to products with a deadlocking latch bolt or a dead bolt. Mount the lock in a test fixture adequate to hold the mortise lock case.

For latch bolts:

Prior to applying the load, depress the latch bolt and auxiliary latch to within 1/8 in. (3.2 mm) of latch front and allow the auxiliary dead latch to start the return to the fully projected position but retain the auxiliary dead latch at a projected position of ¼ in. (6.4 mm) from the latch front by means of a notch block secured to the latch front. Apply an increasing compressive load to the latch bolt in the direction of retraction until the required force is reached. The deadlocking latch bolt shall not depress below ¼ (6.4 mm).

For dead bolts:

Prior to applying the load, fully project the dead bolt. Apply an increasing compressive load to the dead bolt in the direction of retraction until the required force is reached. The dead bolt shall remain projected a minimum of ¾ in. (19.1mm).

Requirements

All grades minimum	
Latch Bolt: 360 lbf (1600 N)	Dead Bolt: 600 lbf (2700 N)

11 FINISH TESTS

These requirements do not predict the performance life of finishes in actual use but are used as a quality control method to insure consistent finish quality. Trim parts (roses, escutcheons, knobs, levers, turns, cylinder guards, lock fronts and strikes) shall meet the required values specified. Category B finishes as defined by A156.18-2012 shall be excluded from any of the following finish test requirements. Tests shall be conducted in accordance with ANSI/BHMA A156.18-2012 for Materials and Finishes.

11.1 **Salt Spray Test Requirements** All Grades unless otherwise specified

Conduct either 11.1.1 or 11.1.2 at the option of the manufacturer.

11.1.1 Neutral Salt Spray Test

Organic coatings on roses, escutcheons, knobs, levers, turns, grips, thumbpieces and cylinder guards	96 Hours
Organic coatings on lock fronts and strikes	24 Hours
Materials without organic coatings	200 Hours

11.2 **Humidity Test**. **Requirements** All Grades. Use Classification 4, Method B, Pencil Hardness 2H.

Organic coatings on roses, escutcheons, knobs, levers, turns, grips, thumbpieces and cylinder guards.	240 Hours
Organic coatings on lock fronts and strikes	48 Hours

11.3 **Finish Hardness Test**. Conduct either 11.3.1 or 11.3.2 at the option of the manufacturer.

11.3.1 Pencil Hardness Test Requirements All Grades

For all material with organic coatings	Grades 1&2 4H Grade 3 4B

11.3.2 Taber Test Requirements All Grades

For all material with organic coatings	500 Cycles

11.4 **Perspiration Test Requirements**. All Grades

For all material with organic coatings	4 Cycles

11.5 **Ultra Violet Light and Condensation Test Requirements** Use UVA 340 lamps.

All Grades and Coatings	144 Hours

APPENDIX A - USER'S GUIDE (NOT A PART OF ANSI/BHMA A156.37)

A-1 **FUNCTIONS AND GRADE LEVELS**

A-1.1 Those wishing a relatively high level of security should specify Grade 1 or Grade 2. Grade 3 is generally used in residential applications with requirements suitable for the intended usage, and strength and security needs

A-1.2 Locks in high traffic areas should use the Operational Grade 1.

A-2 **CYLINDERS** See ANSI/BHMA A156.5

A-2.1 When cylinders with pick and drill resistance are desired, the specifier so indicates. These cylinders are the ones meeting the performance requirements for Grade 1 as listed in ANSI/BHMA A156.5. In addition, they shall have been tested for pick and drill resistance requirements of the Underwriters Laboratories, Inc. Standard UL 437, and be listed or labeled by a nationally recognized independent testing laboratory and be under an in-plant follow-up inspection service.

A-2.2 All cylinders resist picking, but to varying degrees. Measuring pick resistance is difficult and there are many variables, such as:

A-2.2.1 Inconsistencies in keying requirements relating to master keying and grand master keying.

A-2.2.2 Variations among manufacturers concerning pin lengths, hole drilling, plug to housing fit and key cuts.

A-2.2.3 The experience of the picker, location of the cylinder to be picked and type of lock function used.

A-2.3 Because of the diversity and varying grades of cylinders in ANSI/BHMA A156.5 and because cylinder picking ranks low statistically in unauthorized entry, picking has been included only for cylinder Grades 1A.

A-3 **DOORS AND FRAMES**

The provisions of this Standard evaluate locks as a component and do not take under consideration the variety of doors, frames and other components available, some of which are vulnerable under the kinds of attacks described. Therefore, the user of this Standard should select doors, frames and surrounding wall systems compatible with the level of lock security selected.

A-4 **FASTENERS**

Where lock strikes are applied to wood frames under one inch thick, screws normally furnished are not always adequate. Reinforced strikes or screws of sufficient length to engage the structural stud behind the frame should be specified.

A-5 **FINISHES**

For finishes available see manufacturer's catalog. For certified finishes see BHMA Directory of Certified Locks and Latches. Refer to ANSI/BHMA A156.18-2012 for finish description.

PARKING LOT

1.ASSA ABLOY (MIA MERREL) Dec 4, 2018 – Proposal #1

1,Sections/Tables/Figures Proposed for Revision (e.g. Section 1.2 or 1.2.2.);

Section 7.1.5

7.1.5 **Requirements** Maximum. Applicable to any lock operation which can be performed, any or all bolts, and in any order.

Turns All Grades	12 lbf-in. (1Nm)
Keys All Grades	12 lbf-in. (1Nm)
Levers Grade 1	28 lbf-in. (3.1 Nm)
Levers Grade 2	36 lbf-in. (4.0 Nm)
Levers Grade 3	45 lbf-in. (5.0 Nm)
Knobs All Grades	12 lbf-in. (1 Nm)
Paddles	40 lbf (178N)

14

Revise as follows:

- Revise to follow exit device standard? Included here:

Requirements Maximum Torque or Force To Release Latch After Cycling				
Key Only	Knobs	Levers	Thumbpieces	Turns
18 lbf-in. (2 Nm)	18 lbf-in. (2 Nm)	50 lbf-in. (5.7 Nm)	18 lbf (80 N)	27 lbf-in (3 Nm)

Reason/ Supporting Information:

The values above are based on mortise locks. This is unfair because a multipoint lock is operating many other pieces that a mortise lock doesn't interact with. Starting point should be O/S operational for exits, shown in section 2.

Note: Mia to provide additional proposal at next meeting (JAN 2019)

2. ASSA ABLOY (MIA MERREL) Dec 4, 2018 – Proposal #3

Sections/Tables/Figures Proposed for Revision (e.g. Section 1.2 or 1.2.2.);

Section 9.3

Table 9.3 Cycle Requirements, Load Requirements and Test Sequence

Mode	Grade 1	Grade 2	Grade 3
Cycle all bolts including secondary	125,000	75,000	50,000
Cycle primary bolts only	275,000	125,000	50,000
Perform Qualification Tests per 9.4			
Cycle all bolts including secondary	125,000	75,000	50,000
Cycle primary bolts only	275,000	125,000	50,000
Total Cycles	800,000	400,000	200,000
Load	10 lbf (44 N)	5 lbf (22 N)	none

Revise as follows:

- Change cycle requirements for grade 1 to 1million, grade 2 to 500k, grade 3 to 250k

Reason/ Supporting Information: We try to better the raise standards each time we open them, so this would be a reasonable performance improvement.