



STANDARD
FOR
SLIDING AND FOLDING DOOR HARDWARE



SPONSOR
BUILDERS HARDWARE MANUFACTURERS ASSOCIATION, INC.

AMERICAN NATIONAL STANDARDS INSTITUTE
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AMERICAN NATIONAL STANDARD

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This Standard was first published in July 1980 by the Builders Hardware Manufacturers Association, Inc. It was entitled, "Standard 301 BHMA Product Standards Section C, Door Controls (Closers)." ANSI approval was secured under the Canvass Method. BHMA was accredited on 21 March 1983 by ANSI as a sponsor using the Canvass Method.

The general classification of builders hardware includes a wide variety of items which are divided into several categories. To recognize this diversity, a sectional classification system has been established. Sliding and Folding Door Hardware is one such section and this Standard is the 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 it has been necessary, dimensional requirements have been established to insure safety, security and stability to which the public is entitled. There are no restrictions on design, except for those dimensional requirements imposed for the reasons given above. It is also required that some hardware items fit certain specified cutout dimensions.

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. Grade classifications indicate levels only within their own category. Choice of grades and specific products are made on the basis of utility, aesthetics, security objectives and end use desired.

The BHMA numbers and pictorials which indicate types of hardware do not necessarily identify size, finish, or material and are not intended to be used without necessary supplementary information. Individual manufacturer's catalogs are consulted.

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1. SCOPE

1.1 This Standard establishes performance requirements for different size and weight Sliding and Folding Door Hardware used for both residential and commercial applications. This includes cycle, abuse, durability, static load, smoothness, static and kinetic friction tests.

1.2 Tests to evaluate decorative and protective finishes for these products are described in ANSI/BHMA A156.18 for Materials and Finishes and are required to complete certification.

2. DEFINITIONS

2.1 **Activator** A device that interacts with the damper to catch the door and slowly bring the door to its final position (open or closed). Also known as the Trigger.

2.2 **Aligner** A component added to a 4-door bifold set to keep the leading edge of doors flush when closed.

2.3 **Actuator** Part of the test set up in a laboratory that externally acts on the door to provide the linear motion for cycle testing.

2.4 **Damper** A dampening type mechanism that interacts with an activator slowly bringing the door to its final position (open or closed).

2.5 **Guide** A device used to control the lateral movement of a sliding door.

2.6 **Hanger** The weight-bearing connection between the door and track. It suspends the door and facilitates low-friction travel along the track via rollers (wheels).

2.7 **Oversize Sliding Doors** Sliding doors that weigh 240 lbs (109 kg) or greater or are greater than 8 ft in width; doors to be tested to requirements in Section 5.

2.8 **Point of engagement** The point in travel where the damper and activator engage to begin the function of soft close.

2.9 **Sliding Door** - A type of door that opens by sliding along a track parallel to the adjacent wall. Various types of sliding door hardware are available to suit different applications, such as pocket doors that slide into a recessed cavity in the wall, top-hung doors that slide on a track above the doorway, and bottom-rolling doors that slide on a track at the bottom of the frame. Additionally, sliding doors can come in different configurations, with multiple panels that slide open to create a larger opening.

2.10 **Snugger** A device installed in a track to keep doors in a closed position.

2.11 **Soft-close Device** The pairing of a damper and activator intended to gently decelerate the door to its final position (opened or closed).

2.12 **Stay Roller** A roller used to control the lateral movement of a sliding door. (See Guide)

2.13 **Stop** A fixed device used to limit the linear travel of a sliding door.

2.14 **Track** A member containing the hangers and supporting the weight of the door (also called rail).

2.15 **Track Support** Brackets used to hold and fasten the track to the structure above or below the door (also called rail support).

3. GENERAL

3.1 **Test Samples** At random, select hardware from stock. Perform all tests on the same sample in the numerical order of each section.

3.2 **Test Fixtures** The test equipment shall permit installation of the hardware in accordance with the manufacturer's recommendations as described in the template and instruction sheets regularly furnished. Failure of the test fixture does not constitute a pass or failure of the tests. After corrective action is taken on the test fixture, a resubmittal of a new sample of the same design shall be made for retesting.

3.3 Install the hardware by following the instructions provided by the manufacturer and using the provided fasteners.

3.4 Do not add any lubricants to the hardware, including guides, unless specified by the manufacturer.

Lubricants that have been applied during manufacture as standard procedure are permissible. Lubricants shall not be added during the test.

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

3.6 Tolerances All values that do not carry specific tolerances or are not marked maximum or minimum shall have the following tolerances: Linear dimensions shall be $\pm 1/16$ in (1.6 mm). Pounds or pound force shall be $\pm 2\%$. Degrees shall be ± 2 degrees.

3.7 Measuring Equipment All instruments and equipment used in the conduct of 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. The measuring equipment used shall have a known measurement error and be capable of qualifying the value being measured.

3.8 When hardware is part of a fire door assembly it shall be listed and labeled for this use by a Nationally Recognized Testing Laboratory (NRTL).

4. TEST PROCEDURES

4.1 Preparing the Opening

4.1.1 Provide a structurally sound finished opening to the sizes specified by the manufacturer of the hardware to be tested. Brace opening to prevent any movement.

4.1.2 The jambs of this opening shall be plumb and parallel and at right angles to the header. Where applicable, the threshold or bottom track shall be level so as not to interfere with the operation of the doors.

4.1.3 The header shall be suitable for the door widths.

4.1.4 The header shall be straight and level within $3/32$ in (2.4 mm).

4.2 Preparing the Doors Use appropriate height doors for a standard 6 ft 8 in (2032 mm) high opening and the maximum width for which the hardware is recommended. The door panel can be a skeleton frame. Place the doors on the scale one at a time and add enough weight to each door to make its total weight equal to the rating of the hardware. The weights shall be added to locate the center of gravity at the geometrical center of the rectangular door. The weights shall be firmly attached to the doors to prevent their movement as doors open and close. It is permitted to seal and finish doors and frames to minimize warping. The same panel shall be used throughout all of the test procedures, except in static load test (5.1 and 6.2).

4.3 Mounting the Hardware (Bifold)

4.3.1 Install the bifold set in the opening, according to the manufacturer's instruction sheet, using the fasteners furnished with the hardware.

4.3.2 Hardware and doors shall be adjusted so that all adjustable or spring-loaded top and bottom pivot hardware is at the manufacturer's fully extended position(s). Mark or measure track pivot locations.

4.3.3 Remove the doors and accurately measure the lower pivot extension (if adjustable) and mark the pin in such a way that any vertical movement is apparent.

4.3.4 Install the aligner(s) or snugger(s) in the position specified by the manufacturer, if supplied.

4.4 Mounting the Hardware Multiple Folding Types, Bypassing Types, and Pocket Types.

4.4.1 Install the track(s) in the opening.

- 4.4.2 Mount the hangers.
- 4.4.3 Install door(s) and door guide in the opening with the faces and edges of doors plumb.
- 4.4.4 Install the bumper(s), aligner(s), or snugger(s) or a combination thereof.
- 4.4.5 Mark a point 34 1/2 in (876 mm) from the bottom of the door(s) on both vertical edges of each folding door to be tested. Mark a point on each side of the frame horizontal to the marks on the doors.

5. OVERSIZE SLIDING DOORS; BY-PASS, TELESCOPIC AND POCKET TYPES

5.1 **Static Load Test** The track shall be installed with the supports spaced along the track at the manufacturer's recommended spacing. The Static Load Test shall consist of two tests, one with a hanger located midway between two supports and the other with a hanger located directly under a support. Subject the hangers, track, and supports to a static load equal to two times their maximum rated capacity.

Requirements

Permanent deformation shall not exceed 0.062 in (1.6 mm)

5.2 **Static Friction Test** In accordance with Figure 1, using a force gauge placed at 34 ½ in. (876 mm) from the bottom of the door, push or pull the door on its track and record the maximum force to start the door moving when hangers are located midway between the track supports. The average of three trials in each direction shall be the static friction.

Requirements

Maximum force shall be 5% of the door panel weight being tested.

5.3 Durability Test

5.3.1 **Cycle Test** One cycle consists of motion from the closed to open to closed positions. Use an actuator to completely open and close the door between two and four times per minute, with a maximum dwell of five seconds at each position. [Note: The speed cannot exceed 50 ft/min.] The actuator shall engage the door along the center of gravity and shall not impart additional loads other than to provide linear motion (See Figure 1). Throughout the test, the sliding door hardware shall remain operational and not require any adjustments. After completing the durability test, the sliding door assembly shall meet the requirements of 5.2 Static Friction Test.

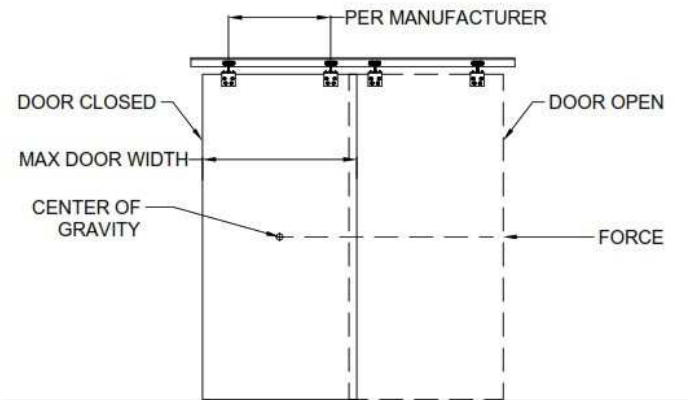


FIGURE 1

Cycle Requirements

Grade 1	Grade 2	Grade 3
35,000 cycles	20,000 cycles	10,000 cycles

5.3.2 Soft Close Device System Tests – Preparation and Requirements. If the sliding door assembly incorporates a soft-close device then it shall be included in the durability test for the system as described in 5.3.1. Only one soft close device shall be installed in the test specimen. The door shall cycle between two and four times per minute, with a maximum dwell time of five seconds at each position. [Note: The speed cannot exceed 50 ft/min.] With the soft-close device installed, the actuator shall cease exerting force on the door before the point of engagement with the activator to allow the damper to bring the door to a fully opened or fully closed position as the only force acting on the door.

5.3.2.1 Engagement Set the door in the opening at the point where the two hardware components for the soft close device are at the point of engagement. Visibly mark on the track or header and on the door where the point of engagement between the damper and its activator occurs. When the damper is activated, it must act independently of the actuator and visibly slow the velocity of the door as it brings the door to its end condition. The soft close device must visibly slow the door through the entire duration of the test.

5.3.2.2 Disengagement When using a soft close device, the disengage force shall be measured. Using a force gauge placed at 34 ½ in. (876 mm) from the bottom of the door, push or pull the door on its track. Starting when the soft close is fully engaged and the door is stationary, record the maximum force to fully disengage and reset the device for the next engagement. The average of three trials shall be the disengage force.

5.3.2.3 After Completion of Required Cycles The device shall be tested at the conclusion of the cycles required for each grade. Following the required cycles for each grade, the soft close device shall continue to disengage with a maximum force of 20% of door panel weight. The soft close device shall also continue to visibly slow the door at the end of each cycle. Activator must reset the damper when the actuator pulls the door away from the point of engagement. The damper must stay reset until the next engagement.

5.4 Hanger/Roller Wear Measurement To measure the gap between the bottom of the door and the finished floor, ensure that the door is fully closed. Measure and record the gap at three locations: 2” in. from the leading edge of the door, the midpoint of the door, and 2” in. from the trailing edge of the door.

Requirement The final measurement shall be within 1/8”in. of the initial measurement.

5.5 Abuse test

5.5.1 Side Load Test Apply the load to the face of the door at a point 34 ½ in. (876 mm) from the bottom of the door and 4 in from the leading edge and hold for 5 seconds ± 2 seconds. To distribute the load use a 4 in (102 mm) diameter rigid disk with a flat face and a 0.5 (12 mm) front edge blend radius. When loaded, the sliding door shall be in the two positions as shown in Figure 2. The door shall be in the partially closed position with a 4 in. gap ± 0.5 in (101 mm gap ± 25 mm) and partially opened position with a 6 in. gap ± 0.5 in (152 mm gap ± 25 mm) from each end of travel. Failure occurs if there is a permanent or catastrophic failure resulting in a safety hazard or impairment of function.

Side Load Requirements

Force (F)
60 lbf (267 kg)

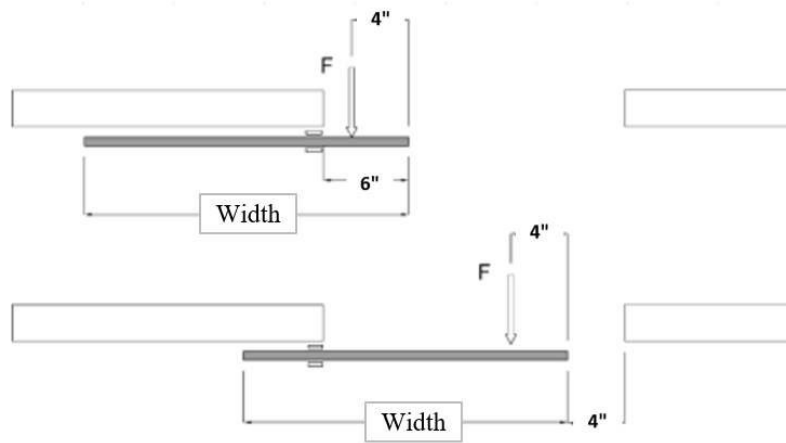


FIGURE 2

5.5.2 Slam Test The sliding door shall be closed rapidly by means of a cable attached at 34 ½ in. (876 mm) from the bottom of the door and 4 in (102 mm) from the leading on the front surface. See Figure 3. Establish the door panel starting position with a mark X in. from the fully closed position. The travel distance (X) and the test weight (W) shall follow the table below. The test weight shall act until 0.5 in (13 mm) before the sliding door is fully closed. For a soft close feature, the test weight shall act until 0.5 in (13 mm) before the mechanism starts. Repeat 10 times at a minimum rate of one cycle every 120 seconds. Neither the sliding door nor any components shall become detached.

Travel Distance (X)	Test Weight (W)
20 in (508 mm)	15.4 lbs (7 kg)

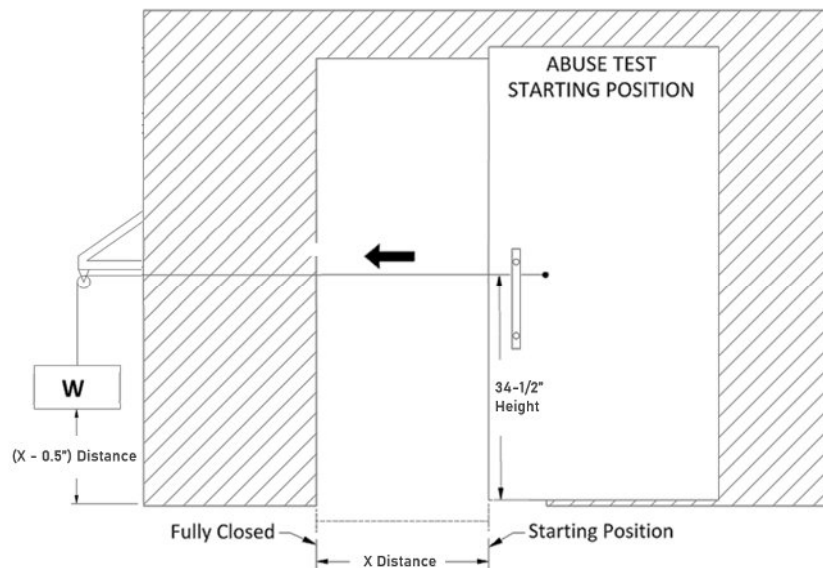


FIGURE 3

6. SLIDING DOORS BY-PASS, TELESCOPIC AND POCKET TYPES

6.1 Operation Test for Smoothness Open the doors. Using the force gauge at 34 ½ in. (876 mm) from the bottom of the door, push or pull the door as slowly as possible until the forward edge of the lead door is within two inches of the fully closed position. Note the maximum force required. Still using the force gauge, slowly urge the door to the open position. Note the maximum force required.

Requirements

The doors shall glide smoothly with no discernible "Stop- Go" action or chatter. The force gauge reading shall not vary more than 2% of the door weight while the door is in motion in either direction.

6.2 Static Load Test The track shall be installed with the supports spaced along the track at the manufacturer's recommended spacing. The Static Load Test shall consist of two tests, one with a hanger located midway between two supports and the other with a hanger located directly under a support. Subject the hangers, track, and supports to a static load equal to two times their maximum rated capacity.

Requirements

Permanent deformation shall not exceed 0.062 in (1.6 mm)

6.3 Static Friction Test

6.3.1 Using a force gauge placed at 34 ½ in. (876 mm) from the bottom of the door, push or pull the door on its track and record the maximum force to start the door moving when hangers are located midway between the track supports. The average of three trials in each direction shall be the static friction.

Requirements

Maximum force shall be 5% of the door panel weight being tested.

6.4 Kinetic Friction Test

6.4.1 Gently nudge one door to start it rolling. Using the force gauge at the 34 1/2 in. (876 mm) marking, determine the minimum number of pounds required to keep it rolling.

6.4.2 Repeat on the same door in the opposite direction.

6.4.3 Repeat on the second door (if applicable).

Requirements

Maximum force shall be 5% of the door panel weight being tested.

6.5 Hanger/Roller Wear Measurement To measure the gap between the bottom of the door and the finished floor, ensure that the door is fully closed. Measure and record the gap at three locations: 2 inches from the leading edge of the door, the midpoint of the door, and 2 inches from the trailing edge of the door.

Requirement The final measurement shall be within 1/8" in. of the initial measurement.