

ANSI/SDI A250.4

Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors



Standards As Tough As Steel.™

Description

- This standard overview focuses on the content and intent of this performance standard.
- The focus is on commercial hollow metal doors, frames and their applicable hardware and how ANSI A250.4 can be used by the design professional in both the selection and specification of commercial door openings.

History

- 1980 - First adopted as and SDI Standard
 - First attempt to replicate on-site door usage in operable test environment
 - Door
 - Frame
 - Hardware
 - Provided manufacturers with uniform method of evaluation
 - Life cycle testing of components and assembly
- 1994 – Adopted as ANSI A156.4
- 1999 – Re-published and adopted as ANSI A250.4

Purpose

- Why developed
 - Provided manufacturers with uniform method of evaluation
 - Life cycle testing of components and assembly
- Methods of testing
 - Two (2) part test procedure:
 - Cycle test at designated level of cycles
 - Twist tests at designated cycle points
 - Operable test:
 - Door cycles with commercial hinges, exit device and closer
 - Replicates on site use and abuse
- How it related to proper selection and usage
 - Length of cycles tested relate to use and application
 - Provides design professional with guidance

Performance Test

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Purpose of the standard:

- ANSI/SDI A250.4 establishes a performance test method for commercial hollow metal openings
- Replicates field operating conditions
 - Operable hardware
 - Door swings opens $60^{\circ} \pm 5^{\circ}$
 - Cycles 15 cycles / minute
 - Twist tests at predefined intervals

AMERICAN NATIONAL STANDARD ANSI A250.4-2001

American National Standard

Test Procedure and Acceptance Criteria for –
Physical Endurance for Steel Doors, Frames,
Frame Anchors and Hardware Reinforcings

1 Purpose

The primary purpose of this procedure shall be to establish a standard method of testing the performance of a steel door mounted in a pressed steel or channel iron frame, installed with appropriate anchors, under conditions that might reasonably be considered an accelerated field operating condition.

The user of this performance standard must temper his usage with the knowledge that there are many variables that affect door performance, such as different hardware, anchors, glass and louver cutouts, field modification by parties other than the manufacturer, environmental factors, such as heat, cold, moisture, etc.

1.1 Reference documents

ANSI/BHMA A156.1-1997 *Butts and Hinges*
ANSI/BHMA A156.3-1994 *Exit Devices*
ANSI/BHMA A156.4-1992 *Door Controls— Closers*
ANSI/BHMA A156.7-1988 (R1997) *Template Hinge Dimensions*

2 Apparatus and equipment

The apparatus and equipment used shall be the same when testing doors, frames or frame anchors. The main testing structure shall be constructed as shown in figures 1 and 2. The structure shall conform to the parts shown, except the opening width and height are permitted to vary to allow the testing of various door sizes. The test frame shall be anchored in such a manner as to insure rigidity.

The swinging mechanism shall be in two parts:

2.1 Door opener

The door opener shall be an air motor positioned at 65° to the plane of the door in its closed position. This will apply pressures on the crossbar of an exit device mounted on the test door. The actual contact point shall be set to push the door far enough to open it $60^{\circ} \pm 5^{\circ}$, and retract to allow the door closer to bring the door back into its original closed position and then begin the cycle again. See the specifications in figures 1 and 1A.

2.2 Hardware

The exit device, door closer and hinges used in testing shall be selected based on the manufacturer's recommendations for the testing level described in Swing Test Form 1. The manufacturer's hardware part number shall be a part of the report. All hardware shall be applied to the door and frame with fasteners normally provided by the hardware manufacturer (for example, machine screws or sex bolts) in the location recommended by the door manufacturer. The hardware shall conform to the latest editions of American National Standards ANSI/BHMA A156.1, 3, and 4. The device shall be set to close the door at an approximate rate of 15 cycles per minute.

Note: Where the applicable BHMA Test Standards has been followed, this information shall be recorded as part of the test report.

3 Preparation for test

The door shall be hung in the frame on the hinges. Hinges used shall conform to American National Standard ANSI/BHMA A156.7-1988

Performance Test

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Test Apparatus:

- Test fixture with pneumatic cylinder to cycle the door at designated rates

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Performance Test

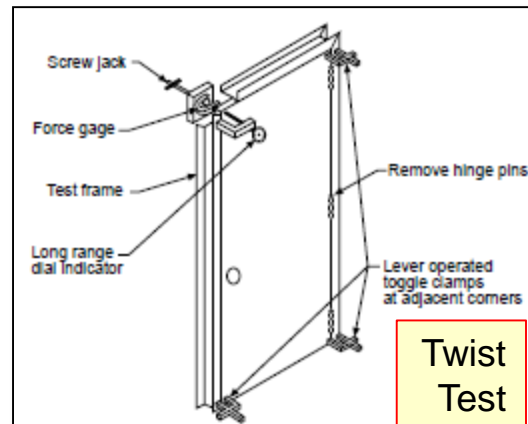
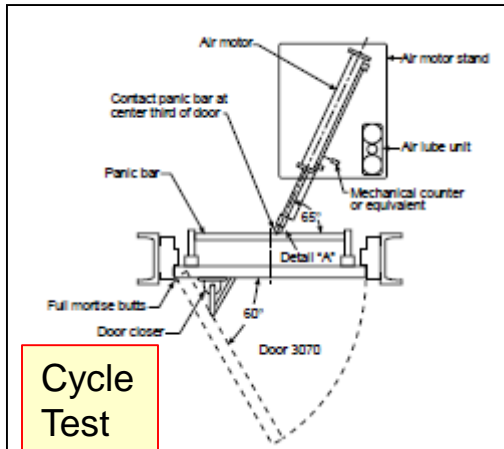
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Test Apparatus:

- Test fixture with pneumatic cylinder to cycle the door at designated rates

Two part test:

- Cycle Test
- Twist Test



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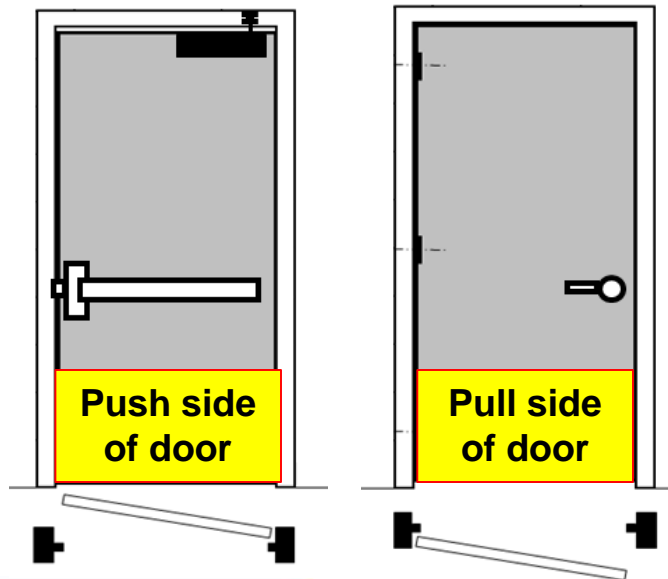
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Performance Test

ANSI A250.4 Page #1

Operable Opening:

- Exit device
- Door closer
- Hinges



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3 Preparation for test

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Overview – Performance Test

ANSI A250.4 Page #2

Test specimen:

- Door:
 - 3070 nominal size door
 - Production doors shall be used
 - Detailed description of the construction

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(R1997), or latest edition. Care shall be taken to insure the hinges are properly applied to the door and frame as recommended by the hinge manufacturers, and any hinge fillers, if any, are in place. The clearance between the door and the frame shall be made part of the performance test report.

The door frame shall be securely fastened to the test frame opening structure in accordance with the manufacturer's instructions. The manufacturer is permitted to select anchors for specific wall applications (i.e., wood stud anchors or steel stud anchors, loose or welded in or existing masonry wall anchors).

Mutes shall be installed on the frame and the stop face of the door shall contact the mutes. The frame shall be checked for plumbness, squareness, rigidity, and general appearance.

When applicable, wall surface materials (e.g., drywall) shall be applied to the test frame opening at the frame throat to simulate actual construction conditions.

4 Test specimen

4.1 Doors

Unless specified otherwise, the test shall be performed on a 3070 nominal size door. Other sizes shall be specified for testing if the user deems it necessary. Any door of the same construction but of lesser size than the successfully tested specimen shall be deemed to have passed. Production doors shall be used except when this procedure is used in experimental work.

A detailed description of the construction of the door and the applicable process such as welding, bonding, etc. used for attaching components, shall be recorded as part of the performance report, Swing Test Form 1, under the "remarks" section.

4.2 Frames

Unless specified otherwise, the test shall be performed on a 3070 nominal size frame having a 5 1/4" jamb depth. Other sizes are permitted to be specified if the user deems it necessary. Production frames and anchors shall be

used, except when this procedure is used in experimental work.

A detailed description of the door frame which shall cover all components used in the frame's construction, as well as applicable processes (such as welding, etc.) used for attaching and connecting components, shall be recorded as part of the performance report, Swing Test Form 2, under the "remarks" section.

4.3 Frame anchors

Unless specified otherwise, anchors tested shall be those designed for a 5 1/4" jamb depth frame. This will allow the test frame vertical support channels to remain at a reasonable size. The test is intended to evaluate the performance of, but not limited to, welded-in-wood stud, loose snap-in wood stud, welded-in steel stud, loose snap-in steel stud, compression anchor, welded-in existing masonry wall and loose snap-in existing masonry wall anchors. Anchors taken from production shall be used, except when this procedure is used in experimental work.

A detailed description of the frame and anchoring system which shall cover all details of the anchors, as well as the means of attachment in the frame and the weight of the door used for the test shall be recorded as part of the performance report, Swing Test Form 2.

5 Swing test

5.1 Doors

Duration of the test shall be 250,000 cycles with latching for Level C doors; 500,000 cycles with latching for Level B doors; and 1,000,000 cycles with latching for Level A doors. A general inspection of the door shall be made at 25,000 cycle intervals for the first 100,000 cycles and at 50,000 cycles thereafter. A mechanical counter or equivalent shall be used to record the cycles.

The general inspection shall cover all components readily accessible, such as face skins, exposed hinge and/or lock stiles, flush closing channels, end closures, hinge reinforcements, and lock body/face plate reinforcements. Additionally, the inspection shall cover the integrity and reliability of processes, such as weld-

Overview – Performance Test

ANSI A250.4 Page #2

Test specimen:

- Frame:
 - Production frame
 - Detailed construction description
 - KD or Welded
- Anchors:
 - Snap-in or welded

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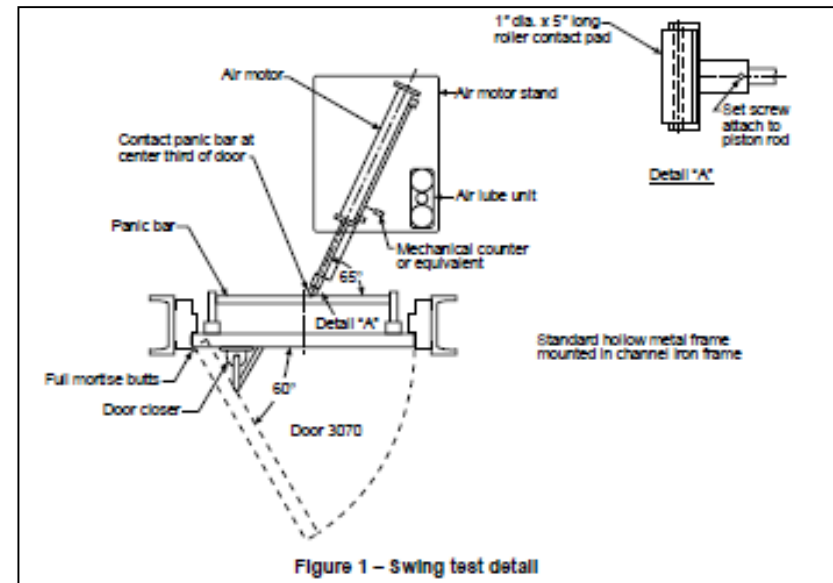
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2

Swing Test

- Purpose:
 - Full-sized operable door to simulate actual applications
 - Evaluate door panel degradation
- Cycles:
 - Level “A” = 1,000,000 cycles
 - Level “B” = 500,000 cycles
 - Level “C” = 250,000 cycles



Refer to ANSI A250.8 for guidance in selecting the correct cycle levels in relationship to opening use, application and abuse.

Swing Test Report

- Report filled out by technician witnessing test
- Test can be witnessed and certified by test lab

Performance Report — Swing Test Form 1

Date _____
Test# _____

Manufacturers _____ Type and Size of Doors _____

Weight of Door _____

Inspection at indicated cycle intervals:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Condition of edge seal/bond																							
Condition of lock prep.																							
Condition of hinge prep.																							
Top																							
Center																							
Bottom																							
Condition of top closure																							
Condition of bottom closure																							
Condition of door consistency																							
Condition of panels — general																							

Level C Door → Level B Door → Level A Door →

⓪ — Satisfactory

Use footnotes under Remarks for further explanation

Hinge Manufacturer & Number _____
Lock Manufacturer & Number _____
Closer Manufacturer & Number _____

Remarks: _____

Page #7

Performance Report — Swing Test Form 2

Date _____
Test# _____

Manufacturers _____ Type and Size of Frame _____

Weight of Door _____ Type of Anchors _____

Inspection at indicated cycle intervals:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Condition of general appearance																							
Condition of perimeter clearance																							
Condition of strike prep.																							
Condition of hinge prep.																							
Top																							
Center																							
Bottom																							
Condition of mutes																							
Condition of wall anchors																							
Condition of floor anchors																							
Condition of miters																							

Level C Frame → Level B Frame → Level A Frame →

⓪ — Satisfactory

Use footnotes under Remarks for further explanation

Hinge Manufacturer & Number _____
Lock Manufacturer & Number _____

Remarks: _____

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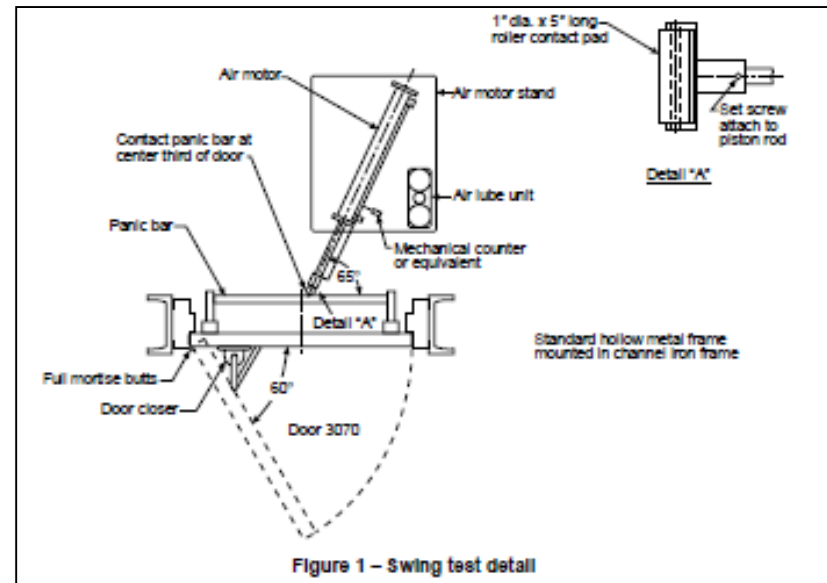
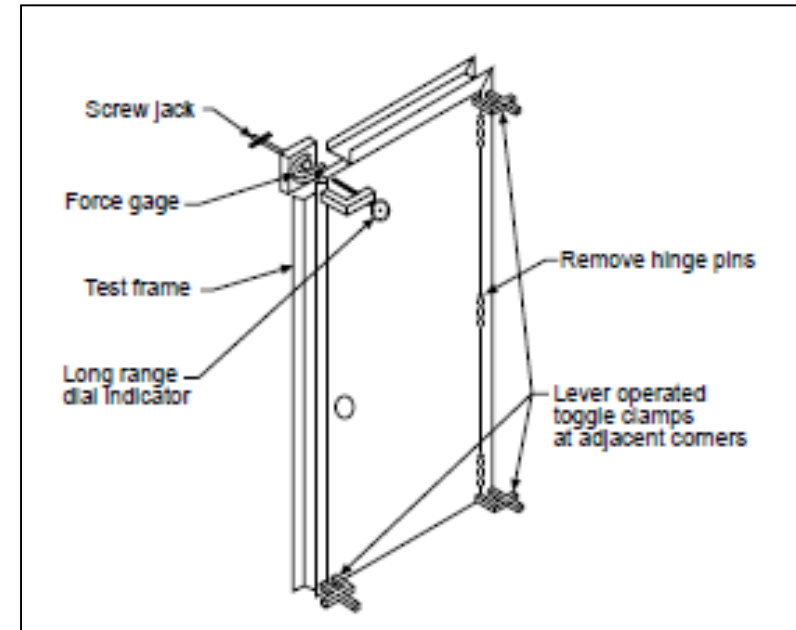


Figure 1 – Swing test detail

Page #7 – Door Evaluation
Page #8 – Frame Evaluation

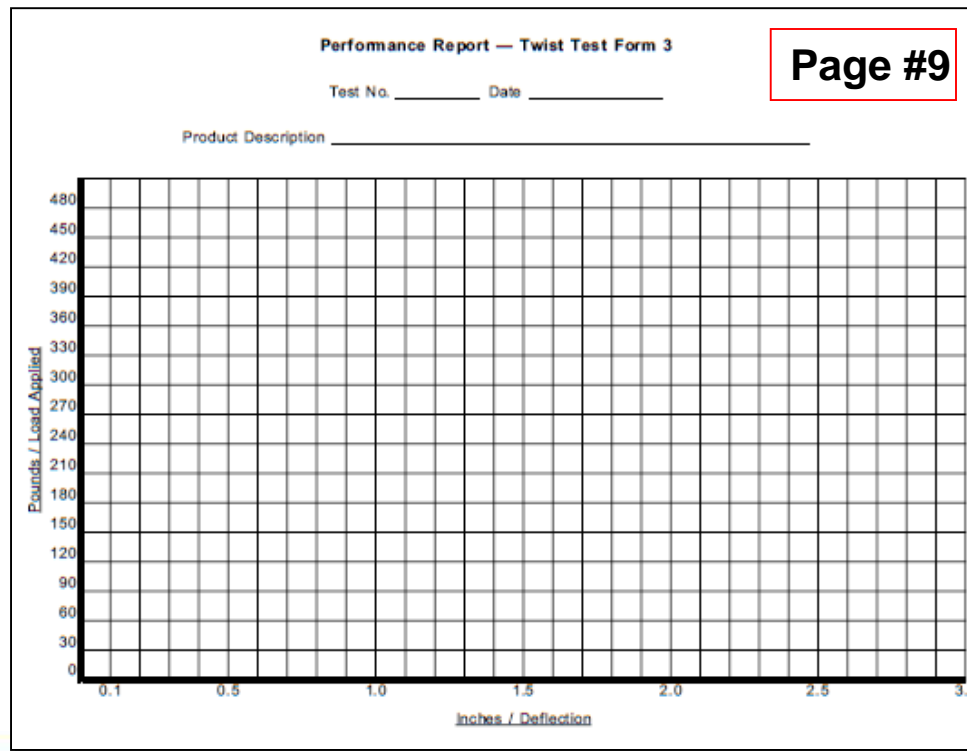
Twist Test

- Purpose:
 - Simulate abuse
 - Evaluate door panel degradation
- Conducted at:
 - 25,000 cycle intervals for the first
 - 100,000 cycles and at 50,000 cycle intervals for the balance of the test.
- Load pressure:
 - Loads in 30 lb. increments
 - Max 300 lb. load applied
 - Reduce load in 30 lb. increments



Twist Test Report

Plotted curve drawn through the points shall graphically demonstrate the reaction of the door to increasing and decreasing pressures at different cycle intervals.



SDI Member Companies



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