

ANSI/BHMA A156.1-2013
Revision of ANSI/BHMA A156.1-2006



AMERICAN NATIONAL STANDARD

FOR

BUTTS AND HINGES



SPONSOR

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION, INC.

AMERICAN NATIONAL STANDARDS INSTITUTE, INC.

Approved March 7, 2013

AMERICAN NATIONAL STANDARD

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether he has approved the Standard or not, from manufacturing, marketing, purchasing, or using products, processes or procedures not conforming to the Standard. American National Standards are subject to periodic review and users are cautioned to obtain the latest editions.

CAUTION NOTICE: This American National Standard is permitted to be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken to reaffirm, revise, or withdraw this Standard no later than five years from the date of publication. Purchasers of American National Standards receive current information on all Standards by calling or writing the American National Standards Institute.

Published by
BUILDERS HARDWARE MANUFACTURERS ASSOCIATION, INC.
355 Lexington Avenue New York, New York 10017
www.buildershardware.com

Copyright ©2013 by the Builders Hardware Manufacturers
Association, Inc.

Not to be reproduced without specific authorization
from BHMA

Printed in the USA

This Standard was first published June 1969 by the Builders Hardware Manufacturers Association. It was entitled, "Standard 101 BHMA Product Standards Section A Butts and Hinges." ANSI approval was secured under the Canvass Method. BHMA was accredited on 21 March 1983 by ANSI as a sponsor using the Canvass Method.

FOREWORD (This Foreword is not a part of ANSI/BHMA A156.1)

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. Butts and Hinges is one such section and 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 insure 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. It is also required that hinges fit certain cut-out 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 with Grade 1 being the top rating. Grade classifications indicate levels only within their own product category. Choice of grade and specific product are made on the basis of utility, aesthetics, security objectives and end use desired.

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

Users of this Standard consult applicable local building codes as to requirements affecting the functions of hinges used on fire doors.

TABLE OF CONTENTS

1.	SCOPE.....	5
2.	DEFINITIONS.....	5
3.	GENERAL.....	6
4.	TEST EQUIPMENT.....	8
5.	TEST PROCEDURES.....	9
6.	TESTS FOR HINGES	1Error
	! Bookmark not defined.	
7.	DETENTION HINGES	13
8.	ILLUSTRATIONS OF TEST APPARATUS FOR FULL MORTISE HINGES.....	15
9.	ILLUSTRATIONS, TYPE NUMBERS AND DESCRIPTIONS OF HINGES.....	16
10.	EXPLANATION OF NUMBERING SYSTEM	24
	APPENDIX A (NOT A PART OF A156.1).....	26

1. SCOPE

1.1 This Standard establishes requirements for lightweight, standard weight, heavy weight and detention hinges. Cycle tests, lateral and vertical wear tests, friction tests, strength tests, finish tests, and material and dimensional requirements are included.

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

1.3 Consult NFPA 80-2010 for Fire Doors and Windows concerning hinge requirements for fire doors.

2. DEFINITIONS

2.1 **Adjustable Hinges** A type of hinge that has one or more mechanisms for moving the position of one hinge leaf relative to the other to optimize alignment.

2.2 Bearings

2.2.1 **Anti-Friction Bearing** Bearing material between the various moving parts of a hinge.

2.2.2 **Plain Bearing** (non anti-friction bearing). When no bearing material is between the various moving parts of a hinge.

2.3 **Butt Hinge** See Full Mortise Hinge

2.4 **Detention Hinge** A hinge having higher security attributes than conventional hinges and subject to more stringent tests. These hinges are usually constructed with a maximum security pin. Alternate designs which meet the higher security attributes are acceptable.

2.5 **Full Mortise Hinge** A hinge having one leaf mortised into the hinge edge of a door and the other leaf mortised into the rabbet of a frame.

2.6 **Full Surface Hinge** A hinge having one leaf attached to the face of a door and the other leaf attached to the face of a door frame.

2.7 **Half Mortise Hinge** A hinge having one leaf mortised into the hinge edge of a door and the other leaf attached to the face of a door frame.

2.8 **Half Surface Hinge** A hinge having one leaf attached to the face of a door and the other leaf mortised into the rabbet of a door frame.

2.9 **Hospital Tips** A hinge barrel having sloped ends.

2.10 **Maximum Security Pin (MSP)** A hinge pin that has been fixed after insertion by welding, pinning, or other permanent means to prevent hinge pin removal without the use of special tools. Set screws are not permitted. Affords greater security than a Non-Removable Pin.

2.11 **Non-Removable Pin (NRP)** A hinge pin secured by a set screw or other equivalent means and affords less security than the Maximum Security Pin. This modification is intended as a deterrent only.

2.12 **Olive Knuckle Hinge** A pivot hinge with a joint shaped like an olive.

2.13 **Pivot Hinge** A hinge with a fixed pin and a single joint having a height less than the adjacent hinge leaves.

2.14 **Raised Barrel** A full mortise hinge having both hinge leaves offset to raise the barrel off the jamb

2.15 Reverse Safety Stud A projecting member on the back of each full mortise leaf that engages a hole in the door and jamb hinge reinforcing plates.

2.16 Safety Stud A projecting member on one surface of a full mortise hinge leaf that engages a hole in the opposite leaf when the door is closed.

2.17 Slip-In Hinge A hinge where one or both leaves slide into a cavity prepared in a door or door frame thus concealing one or both hinge leaves.

2.18 Swaging Offsetting a hinge leaf at the barrel so the surface of the leaf is not tangent to the outer diameter of the barrel.

2.19 Swing Clear Hinge A hinge that swings a door completely clear of the opening when the door is opened 90 to 95 degrees.

3. GENERAL

3.1 Bearing Surfaces Anti-friction bearings shall be used in Grades 1 and 2 for standard and heavy weight hinges.

3.2 Fastenings All products shall be complete with screws, bolts, or other fastenings, as required and of size necessary for application and shall be compatible with the product as to finish and material.

3.3 Swaging The clearance between the leaves of full mortise hinges when closed to the parallel position shall be $1/16 \pm 1/64$ in (1.6 ± 0.4 mm) unless specifically noted otherwise.

3.4 Stainless Steel Pins All standard and heavy weight non-ferrous type hinges of Grades 1, 2, and 3 shall be equipped with stainless steel pins. Protruding heads of any material of stainless steel pins shall match finish of hinge.

3.5 Non-rising Loose Pins Pins shall be removable without damaging exposed surfaces of the hinge or tip and shall be retained by means that offer effective resistance to movement of the pin from its seat, but allows the pin to be removed by moderate force.

3.6 Options Hinges listed are permitted to be equipped with the following options (consult individual manufacturers catalogs):

Hospital Tips	Reverse Safety Stud
Maximum Security Pin (MSP)	Safety Stud
Nonremovable Pins (NRP)	Special Decorator Tips (see manufacturer's catalog)
Raised Barrel	Special Fasteners
Round Corners 5/32 in. (4 mm), 1/4 in. (6.4 mm), or 5/8 in. (16 mm) radius	Special Swaging

3.7 Templates Hinges made to template shall have dimensions, screw hole locations and tolerances in accordance with ANSI/BHMA Standard A156.7-2003 for Template Hinge Dimensions.

3.8 Gage and Fastener Requirements:

Hinge Height +0/-0.015 in. (+0/-0.4 mm) Inches (mm)	Gage of Metal $\pm .005$ in ($\pm .127$ mm) Inches (mm)	No. of Screw Holes per Mortised Leaf
"Note A" Heavy Weight		
4 1/2 (114)	0.180 (4.6) 4 1/2 in. (114 mm) detention hinge is permitted to be .188 $\pm .005$ in (4.8 $\pm .13$ mm)	4
5 (127)	0.190 (4.8)	4
6 (152)	0.203 (5.2)	5
8 (203)	0.203 (5.2)	7 min.
"Note B" Standard Weight		
3 1/2 (89)	0.123 (3.1)	3
4 (102)	0.130 (3.3)	4
4 1/2 (114)	0.134 (3.4)	4
5 (127)	0.146 (3.7)	4
6 (152)	0.160 (4.1)	5
"Note C" Design Options		
The design illustrations and descriptions shown are for type descriptions only and do not limit design options available such as two or three knuckle hinges, concealed bearings and other modifications. Items of each design, therefore, that meet the performance tests in each grade category shall be a design option for the one illustrated. See manufacturers' catalogs.		
Light Weight Hinges		
Metal gauges shall be the manufacturer's standard but not less than .077 in (2 mm) for 3 in (76mm) high hinges and .085 in (2.2mm) for 3 1/2 in (89mm) and 4 in (102mm) high hinges.		

3.9 Dimensions All dimensions which do not carry specific tolerances or are not marked maximum or minimum are permitted to have deviations. US units are used in this Standard with approximate SI unit (metric) equivalents given in parentheses.

3.10 Door Preparation The application of butts and hinges to steel door and frame preparations shall be coordinated with the specifications in ANSI/SDI A250.6 and A250.7 for Steel Doors and Frames.

3.11 Reference to Other Standards Standards referenced in this Standard are available from www.buildershardware.com, www.ansi.org, www.steeldoor.org, and www.astm.org.

4. TEST EQUIPMENT

4.1 Door Provide a door structure of a conventional wood or metal door that is not mortised for hinges, or a skeletonized structure having an equivalent center of gravity in all directions after weights are applied. Hinge mounting surface of a door shall be a continuous steel strip with a minimum thickness of 1/4 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 8.2 for all sizes of square, full mortise hinges. Test door width is 36 in (914 mm).

4.2 Jamb A rigid, vertical steel jamb that is not mortised for hinges with a minimum thickness of 1/4 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 degree test arc.

4.3 Blocks Steel jamb mounting blocks 1/4 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 over-sized to the extent that three 1/2 in - 20 x 3/4 in (12.7 mm - 20 x 19 mm) hexagon head cap screws plus lock washers shall be applied to each block making it tight to the jamb (see 8.2). Holes for these cap screws shall be of such diameter as shall permit 1/8 in (3.2 mm) adjustment in all mounting plane directions before tightening.

4.4 Drilling Hinge jamb mounting blocks as well as door hinge mounting surface shall be drilled and tapped in accordance with the following: Template: Within .005 in (0.13 mm) of true position as shown by manufacturer's template drawing. Non-template: Within .005 in (0.13 mm) of the hole locations of the particular test specimen. Both hole patterns shall be accurately placed so that hinge-pin axes be normally collinear.

4.5 Weighing Means Means of weighing doors of 40 - 300 lbs (18 kg - 136 kg) shall be provided for heavy, standard, and light weight hinges, and up to 1200 lbs (545 kg) for triple weight hinges.

4.6 Test Door Weight Requirements¹

Hinge Height or Type inches (mm)	Grades 1 & 2 lbs (kg)	Grade 3 & Light Weight lbs(kg)	Double Weight lbs(kg)	Triple Weight lbs(kg)
3 (76)	--	40 (18)		
3 1/2 (89)	100 (45)	45 (20)		
4 (102)	125 (57)	60 (27)		
4 1/2 (114)	150 (68)	75 (34)		
5 (127)	175 (79)	100 (45)		
6 (152)	230 (104)	125 (57)		
8 (203)	300 (135)	--		
Double Weight			600 (270)	
Triple Weight				1200 (540)

¹ For Detention Hinges see ASTM F1758.

4.7 Cycles per Minute - All Grades:

- 20 ± 1 for door weighing up to 175 lbs (79 kg)
- 10 to 20 for doors weighing 175 lbs. (79 kg) to 300 lbs (135 kg)
- Up to 10 for doors weighing over 300 lbs (135 kg)

4.8 Actuator for Operating Door. (See 5.9)

4.9 **Cycle Counter** Mechanical or electrical counters which register one cycle for each complete opening and closing of test door.

4.10 **Instruments** Precision instruments accurate within 5% suitable for measuring lateral and vertical wear.

5. TEST PROCEDURES

5.1 **Hinges to Test** Tests described apply only to square full mortise hinges. Providing that narrow widths or companion hinges such as half surface, half mortise and full surface types have a similar barrel construction, certification of square full mortise hinges shall apply to these other types. The manufacturer shall attest that barrel constructions of these other types (in any one size) are identical in all significant respects.

5.1.1 Plain bearing non-ferrous hinges, pivot hinges and olive knuckle hinges shall not be tested and have been included in this standard for informational purposes only. The grades given in the type numbers for these hinges are informational guidelines for relative door weights. Please consult manufacturers catalogs for additional details.

5.2 **Selection** At random, select three square full mortise type finished hinges from manufacturer's latest production run.

5.3 **Number of Test Hinges** Tests shall be conducted using three hinges per door.

5.4 **Application** The hinges, fully assembled and with pins fully seated, shall be applied to the door using such screws supplied by the manufacturer. For alignment, a straight edge shall be laid along the edge of the door at such position as corresponds to the back edge of a recommended mortise. In applying the hinges, the back edge of the door leaf shall be abutted firmly against this straight edge as the screws are applied and tightened. Jamb mounting blocks shall then be applied to the hinge jamb leaves using the screws supplied. Screws shall be firmly tightened. The door with its three hinges and jamb mounting blocks, shall be positioned against the vertical jamb and the hexagon head cap screws and lock washers applied finger tight. Align edges of jamb leaves with straight edge and tighten cap screws securely. Door and jamb leaves of the hinges shall not be mortised.

5.5 **Hinge Spacing** Spacing of hinges shall be as indicated in 9.2.

5.6 **Safety Barrier** A safety barrier shall be provided on the test setup to restrict any rise of pins to 1/4 in (6.4 mm) during the dynamic load test. Nothing additional shall be done to the hinge to prevent pin rise (10.2) during the dynamic load test, any pins that do rise shall not be deliberately resealed.

5.7 **Lubricants** Lubricants that have been applied during manufacture as a standard procedure are permitted, but lubricants shall not be added during the test.

5.8 **Test Environment** Tests shall be conducted in ambient room conditions.