

ASME B16.14-2018
(Revision of ASME B16.14-2013)

Ferrous Pipe Plugs, Bushings, and Locknuts With Pipe Threads

AN AMERICAN NATIONAL STANDARD



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Mechanical Engineers**

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FOREWORD

In 1921, the American Engineering Standards Committee [later the American Standards Association (ASA)] organized Sectional Committee B16 to unify and develop standards for pipe flanges and fittings. Cosponsors of the B16 Committee were The American Society of Mechanical Engineers (ASME), the Heating and Piping Contractors National Association [now Mechanical Contractors Association of America (MCAA)], and the Manufacturers Standardization Society of the Valve and Fitting Industry (MSS). Cosponsors were later designated as Co-Secretariat organizations.

Threaded fittings were also included in the scope of the B16 Committee, and Subcommittee 2 (now Subcommittee B) was made responsible for threaded fittings other than steel.

The American Standard for Pipe Plugs was originally published as ASA B16e2-1936. It had been developed by Subcommittee 2 from material assembled and published by MSS as a standard practice in April 1929.

From the beginning, pipe plugs have been made with the American Standard Taper Pipe Thread, but the design of the square heads necessary to screw them into fittings or any tapped hole has been a matter of manufacturers' and users' individual design. However, the use of pipe plugs soon broadened, and they came to be employed in many other service applications, e.g., automotive and industrial machinery. Accordingly, it was natural for the dimensions of the square heads and the sockets to conform to standard open wrench sizes and to maximum dimensions of standard hot-rolled steel bars.

Pipe bushing and locknut dimensions were originally included in ASA B16c-1939, American Standard for 150 lb Malleable Iron Screwed Fittings. ASA B16c-1939 was adapted from information assembled and published by MSS in 1929.

In response to a demand for inclusion under one cover, B16.14-1943, American Standard for Ferrous Plugs, Bushings, Locknuts, and Caps, was developed from ASA B16c-1939 and ASA B16d-1941, American Standard for Cast Iron Screwed Fittings, 125 lb and 250 lb, and approved by ASA in October 1943. The section of B16.14 covering pipe caps was later removed because of differences in pressure ratings between caps made of cast iron and malleable iron.

This Standard was revised in 1948 and approved by letter ballot vote of the Sectional Committee. Following the approval by the sponsor bodies, it was presented to ASA, now the American National Standards Institute (ANSI), with recommendations for approval as an American Standard. This approval and designation was given on April 6, 1949.

Subcommittee 2 began a review of the document in 1963 and completed its work in 1964. The Sectional Committee approved a number of minor changes in format and wording. Following approval by the sponsor organizations, ANSI approval was granted on November 12, 1965.

In 1970, a review was initiated by Subcommittee 2 that resulted in the proposal to revise the document in several minor areas and update referenced standards. Following approvals by the B16 Standards Committee and Co-Secretariat, ANSI granted approval on November 1, 1971.

In 1975, review was again initiated by Subcommittee B (formerly Subcommittee 2), and it was determined that the only significant changes needed were the updating of referenced standards and the addition of metric equivalents. Approvals were granted by the B16 Standards Committee, Co-Secretariat, and ANSI, the latter on February 4, 1977.

In 1982, the American National Standards Committee was reorganized as an ASME Committee operating under procedures accredited by ANSI. That same year, Subcommittee B once again began review of the Standard. The only changes made were the dates of the referenced standards. After approval by the B16 Standards Committee and ASME, final approval was granted by ANSI in July 1983.

In the 1991 edition of B16.14, U.S. Customary units were established as the standard and updates were made to the referenced standards and minimum specifications for steel fittings. Following approval by the B16 Standards Committee and ASME, approval as an American National Standard was given by ANSI on January 4, 1991, with the new designation ASME B16.14-1991.

In the 2010 edition of B16.14, SI units became the primary units, and U.S. Customary units were incorporated into the Standard as secondary units and shown in parentheses. Following approval by the B16 Standards Committee and the ASME Board, the revision to the 1991 edition of the Standard was approved as an American National Standard by ANSI on April 1, 2010, and designated as ASME B16.14-2010.

In the 2013 edition, section 8 was revised to require threads and gaging practices to be as per, and identical with, ASME B1.20.1 and other B16 standards. Following approval by the ASME B16 Standards Committee, approval as an American National Standard was given by ANSI on July 29, 2013, with the new designation ASME B16.14-2013.

In this 2018 edition, the U.S. Customary tables formerly in Mandatory Appendix I have been merged with the SI tables in the main text; the tables have been redesignated, Mandatory Appendix I has been deleted, and the cross-references have been updated accordingly. In addition, all reference standards in what was formerly Mandatory Appendix II were updated. Following approval by the ASME B16 Standards Committee, approval as an American National Standard was given by ANSI on August 3, 2018, with the new designation ASME B16.14-2018.

ASME B16 COMMITTEE

Standardization of Valves, Flanges, Fittings, and Gaskets

(The following is the roster of the Committee at the time of approval of this Standard.)

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CORRESPONDENCE WITH THE B16 COMMITTEE

General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions or a case, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B16 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
<http://go.asme.org/Inquiry>

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued to provide alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard and the paragraph, figure, or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

Interpretations. Upon request, the B16 Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B16 Standards Committee.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at <http://go.asme.org/InterpretationRequest>. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she may e-mail the request to the Secretary of the B16 Standards Committee at SecretaryB16@asme.org, or mail it to the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a “yes” or “no” reply is acceptable.
Proposed Reply(ies):	Provide a proposed reply(ies) in the form of “Yes” or “No,” with explanation as needed. If entering replies to more than one question, please number the questions and replies.
Background Information:	Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in the format described above may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

Moreover, ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the inquiry information submitted, it is the opinion of the Committee that the Inquirer should seek assistance, the inquiry will be returned with the recommendation that such assistance be obtained.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B16 Standards Committee regularly holds meetings and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the B16 Standards Committee.

ASME B16.14-2018

SUMMARY OF CHANGES

Following approval by the ASME B16 Standards Committee and ASME, and after public review, ASME B16.14-2018 was approved by the American National Standards Institute on August 3, 2018.

In ASME B16.14-2018, the U.S. Customary tables formerly in Mandatory Appendix I have been merged with the SI tables in the main text; the tables have been redesignated, Mandatory Appendix I has been deleted, and the cross-references have been updated accordingly. In addition, this edition includes the following change identified by a margin note, **(18)**. The Record Number listed below is explained in more detail in the “List of Changes in Record Number Order” following this Summary of Changes.

<i>Page</i>	<i>Location</i>	<i>Change (Record Number)</i>
10	Mandatory Appendix I	Formerly Mandatory Appendix II, updated (18-798)

LIST OF CHANGES IN RECORD NUMBER ORDER

<u>Record Number</u>	<u>Change</u>
18-798	Updated references in Mandatory Appendix I, formerly Mandatory Appendix II.

FERROUS PIPE PLUGS, BUSHINGS, AND LOCKNUTS WITH PIPE THREADS

1 SCOPE

This Standard covers the following:

- (a) pressure–temperature ratings
- (b) size
- (c) marking
- (d) materials
- (e) dimensions and tolerances
- (f) threading
- (g) pattern taper

2 GENERAL

2.1 References

Standards and specifications adopted by reference are shown in [Mandatory Appendix I](#). It is not considered practical to identify the edition of each referenced standard and specification in the text. Instead, the editions of the referenced standards and specifications are listed in [Mandatory Appendix I](#).

2.2 Quality Systems

Requirements relating to the product manufacturer's quality system program are described in [Nonmandatory Appendix A](#).

2.3 Relevant Units

This Standard states values in both SI (metric) units and U.S. Customary units. These systems of units are to be regarded separately as standard. Within the text, the U.S. Customary units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, it is required that each system of units be used independently of the other. Combining values from the two systems constitutes nonconformance with the Standard.

2.4 Service Conditions

Criteria for selection of materials suitable for particular fluid service are not within the scope of this Standard.

2.5 Convention

For determining conformance with this Standard, the convention for fixing significant digits where limits (maximum and minimum values) are specified shall be as defined in ASTM E29. This requires that an observed or calculated value be rounded off to the nearest unit in the last right-hand digit used for expressing the limit. Decimal

values and tolerances do not imply a particular method of measurement.

2.6 Denotation

2.6.1 Pressure Rating Designation. Class followed by a dimensionless number is the designation for pressure–temperature ratings.

2.6.2 Size. Nominal pipe size (NPS) followed by a dimensionless number is the designation for nominal flange or flange fitting size. NPS is related to the reference nominal diameter, DN, used in international standards. The relationship is, typically, as follows:

NPS	DN
1	25
1¼	32
1½	40
2	50
2½	65
3	80
3½	90
4	100

For NPS ≥ 4, the related DN = 25 × (NPS)

3 PRESSURE–TEMPERATURE RATINGS

(a) Pressure–temperature ratings for plugs and bushings shall be in accordance with ASME B16.4 if made of cast iron, or ASME B16.3 if made of malleable iron, ductile iron, or steel. Use of cored plugs or hexagon head bushings should be limited to Class 125 cast iron and Class 150 malleable iron threaded fittings. Solid plugs and face bushings are recommended for use with Class 250 cast iron fittings and Class 300 malleable iron fittings.

(b) Locknuts are not pressure–temperature rated.

4 NOMINAL PIPE SIZE

As applied in this Standard, the use of the phrase “nominal pipe size” or the designation NPS followed by a dimensionless number is for identifying the end connection of fittings. The number is not necessarily the same as the fitting inside diameter.

5 MARKING

Each fitting shall be marked for identification with the manufacturer's name or trademark, except where a marking is impractical.

6 MATERIALS

(a) These fittings are furnished in gray iron, malleable iron, ductile iron, or steel as indicated in the individual tables.

(b) The chemical and mechanical properties of cast material shall equal or exceed those properties listed in ASTM A126, as applicable. Steel castings, forgings, or machined bar properties shall correspond to the comparable ASTM casting material specifications. The fittings manufacturer shall be prepared to certify conformance based on test data.

7 DIMENSIONS AND TOLERANCES

(a) Dimensions in metric units are given in [Tables 7-1 through 7-5](#) for various types of fittings.

(b) At no point in the component wall shall the metal thickness be less than 90% of the values listed in the tables.

8 THREADS

8.1 Thread Form

All threads shall be in accordance with ASME B1.20.1.

8.1.1 Countersinks and Chamfers. All internal taper pipe threads shall be countersunk or chamfered a distance of not less than one-half the pitch of the thread at an angle of approximately 45 deg with the axis of the thread. External taper pipe threads shall be chamfered at an angle between 30 deg and 45 deg with the axis, for easier entrance in making a joint and protection of the thread. Countersinking and chamfering shall be concentric with the threads. The length of threads specified in all tables shall be measured to include the countersink or chamfer.

8.1.2 Alignment. The maximum allowable variation in the alignment of threads of all openings shall be 5.0 mm/m (0.06 in./ft).

8.1.3 Internal Threading. All fittings with internal threads, except locknuts, shall be threaded with ASME B1.20.1 NPT threads. The reference point for gaging is the starting end of the fitting, provided the chamfer does not exceed the major diameter of the internal thread. When a chamfer on the internal thread exceeds this limit, the reference point becomes the last thread scratch on the chamfer cone.

8.1.4 External Threading. All externally threaded fittings shall be threaded with ASME B1.20.1 NPT threads. The reference point for gaging is the end of the thread, provided the chamfer is not smaller than the minor diameter of the external thread. When a chamfer on the external thread exceeds this limit, the reference point becomes the last thread scratch on the chamfer cone.

8.1.5 Locknuts. Locknuts shall be threaded with ASME B1.20.1 NPSL threads.

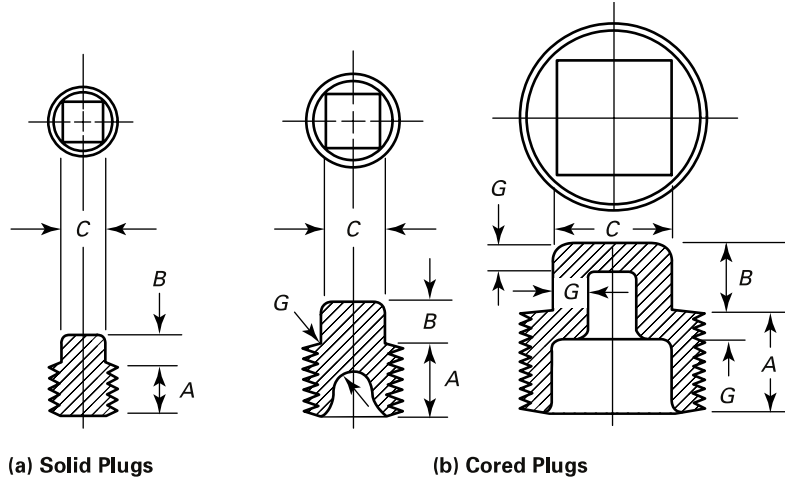
8.2 Gaging Tolerances

For taper pipe threads, the variation in threading shall be limited to one turn large or small from the gaging notch on the plug or the gaging face of the ring when using working gages.

9 PATTERN TAPER

Plug squares or hexagons, raised or countersunk, may have opposite sides tapered a maximum of 4 deg total.

Table 7-1 Dimensions of Square Head Plugs



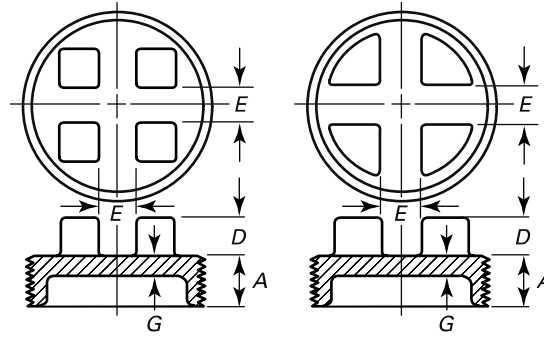
NPS [Notes (1), (2)]	Minimum Thread Length, A, mm (in.)	Minimum Height of Square, B, mm (in.)	Nominal Width Across Flats, C, in. [Note (3)]	Nominal Metal Thickness, G, mm (in.) [Note (4)]
1/8	9.4 (0.37)	6.1 (0.24)	9/32	...
1/4	11.2 (0.44)	7.1 (0.28)	3/8	...
3/8	12.2 (0.48)	7.9 (0.31)	7/16	...
1/2	14.2 (0.56)	9.7 (0.38)	9/16	4.1 (0.16)
3/4	16.0 (0.63)	11.2 (0.44)	5/8	4.6 (0.18)
1	19.1 (0.75)	12.7 (0.50)	13/16	5.1 (0.20)
1 1/4	20.3 (0.80)	14.2 (0.56)	15/16	5.6 (0.22)
1 1/2	21.1 (0.83)	15.8 (0.62)	1 1/8	6.1 (0.24)
2	22.4 (0.88)	17.3 (0.68)	15/16	6.6 (0.26)
2 1/2	27.2 (1.07)	18.8 (0.74)	1 1/2	7.4 (0.29)
3	28.7 (1.13)	20.3 (0.80)	1 11/16	7.9 (0.31)
3 1/2	30.0 (1.18)	21.8 (0.86)	1 7/8	8.6 (0.34)

GENERAL NOTE: Nominal width across flats is given in inches.

NOTES:

- (1) Solid plugs are provided in NPS 1/8 to NPS 3 1/2, incl.; cored plugs, NPS 1/2 to NPS 3 1/2, incl.
- (2) For NPS 4 and larger, slotted or bar pattern plugs are provided (see Table 2).
- (3) These dimensions are the nominal width across flats as given in ASME B18.2.1, Table 1. Square head plugs are designed to fit these wrenches.
- (4) Cored plugs have metal thickness at all points equal to dimension G, except at the end of the thread. For tolerance, see para. 7(b).

Table 7-2 Dimensions of Bar or Slotted Head Plugs



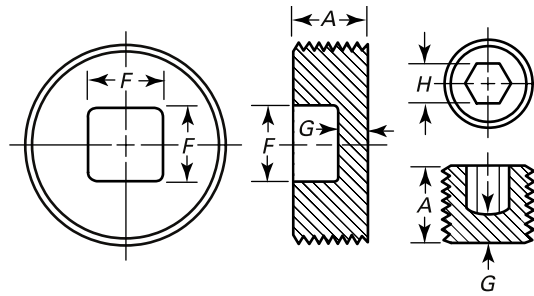
Optional Designs

NPS	Minimum Thread Length, <i>A</i> , mm (in.)	Minimum Height of Lug, <i>D</i> , mm (in.)	Minimum Distance Between Lugs, <i>E</i> , mm (in.)	Metal Thickness, <i>G</i> , mm (in.) [Note (1)]
4	31.0 (1.22)	25.4 (1.00)	22.4 (0.88)	9.4 (0.37)
5	33.3 (1.31)	25.4 (1.00)	22.4 (0.88)	11.7 (0.46)
6	35.6 (1.40)	31.8 (1.25)	31.8 (1.25)	13.2 (0.52)
8	39.9 (1.57)	35.1 (1.38)	38.1 (1.50)	16.8 (0.66)

GENERAL NOTE: For NPS 3½ and smaller, square head plugs are provided (see Table 1).

NOTE: (1) Cored plugs have metal thickness at all points equal to dimension *G*, except at the end of the thread. For tolerance, see para. 7(b).

Table 7-3 Dimensions of Countersunk Plugs



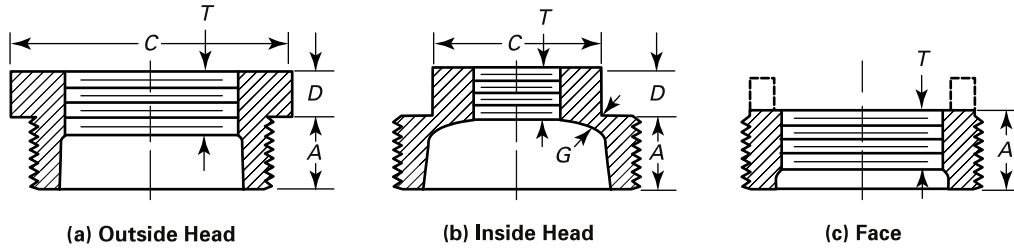
NPS	Minimum Thread Length, A, mm (in.)	Nominal Size of Square Socket, F, in. [Note (1)]	Size of Hexagon, H, in. [Note (2)]	Metal Thickness, G, mm (in.) [Note (3)]
1/8	9.4 (0.37)	...	3/16	1.5 (0.06)
1/4	11.2 (0.44)	...	1/4	2.3 (0.09)
3/8	12.2 (0.48)	...	5/16	3.3 (0.13)
1/2	14.2 (0.56)	3/8	3/8	4.1 (0.16)
3/4	16.0 (0.63)	1/2	9/16	4.6 (0.18)
1	19.1 (0.75)	1/2	5/8	5.1 (0.20)
1 1/4	20.3 (0.80)	3/4	...	5.6 (0.22)
1 1/2	21.1 (0.83)	3/4	...	6.1 (0.24)
2	22.4 (0.88)	7/8	...	6.6 (0.26)
2 1/2	27.2 (1.07)	1 1/8	...	7.4 (0.29)
3	28.7 (1.13)	1 3/8	...	7.9 (0.31)
3 1/2	30.0 (1.18)	1 1/2	...	8.6 (0.34)
4	31.0 (1.22)	2	...	9.4 (0.37)

GENERAL NOTE: Nominal sizes of square sockets and sizes of hexagons are given in inches.

NOTES:

- (1) Square socket within countersunk pattern shall have dimensions to fit commercial square bars of sizes indicated.
- (2) Hexagon socket within countersunk pattern shall have dimensions to fit regular wrenches used with hexagon socket set screws.
- (3) For metal thickness tolerance, see para. 7(b).

Table 7-4 Dimensions of Outside Head, Inside Head, and Face Bushings



NPS [Note (1)]	Minimum Length of External Thread, A, mm (in.) [Note (2)]	Minimum Length of Internal Thread, T, mm (in.)	Minimum Height of Head, D, mm (in.)	Minimum Width of Head, C, mm (in.) [Note (3)]		Nominal Metal Thickness, G, mm (in.) [Note (4)]
				Outside	Inside	
1/4 x 1/8	11.2 (0.44)	6.6 (0.26) [Note (5)]	3.6 (0.14)	16.3 (0.64) [Note (6)]	...	...
3/8 x 1/4	12.2 (0.48)	10.2 (0.40) [Note (5)]	4.1 (0.16)	17.3 (0.68) [Note (6)]	...	...
3/8 x 3/8	12.2 (0.48)	6.4 (0.25)	4.1 (0.16)	17.3 (0.68) [Note (6)]	...	...
1/2 x 3/8	14.2 (0.56)	10.4 (0.41) [Note (5)]	4.8 (0.19)	22.1 (0.87) [Note (6)]	...	...
1/2 x 1/4	14.2 (0.56)	8.1 (0.32)	4.8 (0.19)	22.1 (0.87) [Note (6)]	...	...
1/2 x 1/8	14.2 (0.56)	6.4 (0.25)	4.8 (0.19)	22.1 (0.87) [Note (6)]	...	...
3/4 x 1/2	16.0 (0.63)	13.5 (0.53) [Note (5)]	5.6 (0.22)	29.2 (1.15) [Note (6)]	...	...
3/4 x 3/8	16.0 (0.63)	9.1 (0.36)	5.6 (0.22)	29.2 (1.15) [Note (6)]	...	...
3/4 x 1/4	16.0 (0.63)	8.1 (0.32)	5.6 (0.22)	29.2 (1.15) [Note (6)]	...	...
3/4 x 1/8	16.0 (0.63)	6.4 (0.25)	5.6 (0.22)	29.2 (1.15) [Note (6)]	...	...
1 x 3/4	19.1 (0.75)	12.7 (0.50)	6.4 (0.25)	36.1 (1.42) [Note (6)]	...	...
1 x 1/2	19.1 (0.75)	10.9 (0.43)	6.4 (0.25)	36.1 (1.42) [Note (6)]	...	...
1 x 3/8	19.1 (0.75)	9.1 (0.36)	7.6 (0.30)	...	28.5 (1.12)	...
1 x 1/4	19.1 (0.75)	8.1 (0.32)	7.6 (0.30)	...	28.5 (1.12)	...
1 x 1/8	19.1 (0.75)	6.4 (0.25)	7.6 (0.30)	...	28.5 (1.12)	...
1 1/4 x 1	20.3 (0.80)	14.7 (0.58)	7.1 (0.28)	44.7 (1.76)	...	...
1 1/4 x 3/4	20.3 (0.80)	12.7 (0.50)	7.1 (0.28)	44.7 (1.76)	...	...
1 1/4 x 1/2	20.3 (0.80)	10.9 (0.43)	8.6 (0.34)	...	34.0 (1.34)	4.8 (0.18)
1 1/4 x 3/8	20.3 (0.80)	9.1 (0.36)	8.6 (0.34)	...	28.5 (1.12)	4.8 (0.18)
1 1/4 x 1/4	20.3 (0.80)	8.1 (0.32)	8.6 (0.34)	...	28.5 (1.12)	4.8 (0.18)
1 1/2 x 1 1/4	21.1 (0.83)	18.0 (0.77) [Note (5)]	7.9 (0.31)	50.8 (2.00)	...	...
1 1/2 x 1	21.1 (0.83)	14.7 (0.58)	7.9 (0.31)	50.8 (2.00)	...	...
1 1/2 x 3/4	21.1 (0.83)	12.7 (0.50)	9.4 (0.37)	...	41.4 (1.63)	5.1 (0.20)
1 1/2 x 1/2	21.1 (0.83)	10.9 (0.43)	9.4 (0.37)	...	34.0 (1.34)	5.1 (0.20)
1 1/2 x 3/8	21.1 (0.83)	9.1 (0.36)	9.4 (0.37)	...	28.5 (1.12)	5.1 (0.20)
1 1/2 x 1/4	21.1 (0.83)	8.1 (0.32)	9.4 (0.37)	...	28.5 (1.12)	5.1 (0.20)
2 x 1 1/2	22.4 (0.88)	17.8 (0.70)	8.6 (0.34)	63.0 (2.48)	...	...
2 x 1 1/4	22.4 (0.88)	17.0 (0.67)	8.6 (0.34)	63.0 (2.48)	...	...
2 x 1	22.4 (0.88)	14.7 (0.58)	10.4 (0.41)	...	49.5 (1.95)	5.6 (0.22)
2 x 3/4	22.4 (0.88)	12.7 (0.50)	10.4 (0.41)	...	41.4 (1.63)	5.6 (0.22)
2 x 1/2	22.4 (0.88)	10.9 (0.43)	10.4 (0.41)	...	34.0 (1.34)	5.6 (0.22)
2 x 3/8	22.4 (0.88)	9.1 (0.36)	10.4 (0.41)	...	28.5 (1.12)	5.6 (0.22)
2 x 1/4	22.4 (0.88)	8.1 (0.32)	10.4 (0.41)	...	28.5 (1.12)	5.6 (0.22)

Table 7-4 Dimensions of Outside Head, Inside Head, and Face Bushings (Cont'd)

NPS [Note (1)]	Minimum Length of External Thread, A, mm (in.) [Note (2)]	Minimum Length of Internal Thread, T, mm (in.)	Minimum Height of Head, D, mm (in.)	Minimum Width of Head, C, mm (in.) [Note (3)]		Nominal Metal Thickness, G, mm (in.) [Note (4)]
				Outside	Inside	
2½ × 2	27.2 (1.07)	19.1 (0.75)	9.4 (0.37)	75.7 (2.98)	...	...
2½ × 1½	27.2 (1.07)	17.8 (0.70)	11.2 (0.44)	68.1 (2.68)	...	...
2½ × 1¼	27.2 (1.07)	17.0 (0.67)	11.2 (0.44)	...	60.7 (2.39)	6.1 (0.24)
2½ × 1	27.2 (1.07)	14.7 (0.58)	11.2 (0.44)	...	49.5 (1.95)	6.1 (0.24)
2½ × ¾	27.2 (1.07)	12.7 (0.50)	11.2 (0.44)	...	41.4 (1.63)	6.1 (0.24)
2½ × ½	27.2 (1.07)	10.9 (0.43)	11.2 (0.44)	...	34.0 (1.34)	6.1 (0.24)
3 × 2½	28.7 (1.13)	23.4 (0.92)	10.2 (0.40)	98.0 (3.86)	...	...
3 × 2	28.7 (1.13)	19.1 (0.75)	12.2 (0.48)	83.3 (3.28)	...	...
3 × 1½	28.7 (1.13)	17.8 (0.70)	12.2 (0.48)	...	68.1 (2.68)	6.6 (0.26)
3 × 1¼	28.7 (1.13)	17.0 (0.67)	12.2 (0.48)	...	60.7 (2.39)	6.6 (0.26)
3 × 1	28.7 (1.13)	14.7 (0.58)	12.2 (0.48)	...	49.5 (1.95)	6.6 (0.26)
3 × ¾	28.7 (1.13)	12.7 (0.50)	12.2 (0.48)	...	41.4 (1.63)	6.6 (0.26)
3 × ½	28.7 (1.13)	10.9 (0.43)	12.2 (0.48)	...	34.0 (1.34)	6.6 (0.26)
3½ × 3	30.0 (1.18)	24.9 (0.98)	10.9 (0.43)	117.3 (4.62)	...	...
3½ × 2½	30.0 (1.18)	23.4 (0.92)	13.2 (0.52)	98.0 (3.86)	...	...
3½ × 2	30.0 (1.18)	19.1 (0.75)	13.2 (0.52)	...	83.3 (3.28)	7.1 (0.28)
3½ × 1½	30.0 (1.18)	17.8 (0.70)	13.2 (0.52)	...	68.1 (2.68)	7.1 (0.28)
3½ × 1¼	30.0 (1.18)	17.0 (0.67)	13.2 (0.52)	...	60.7 (2.39)	7.1 (0.28)
3½ × 1	30.0 (1.18)	14.7 (0.58)	13.2 (0.52)	...	49.5 (1.95)	7.1 (0.28)
4 × 3½	31.0 (1.22)	26.2 (1.03)	12.7 (0.50)	132.1 (5.20)	...	...
4 × 3	31.0 (1.22)	24.9 (0.98)	12.7 (0.50)	117.3 (4.62)	...	...
4 × 2½	31.0 (1.22)	23.4 (0.92)	15.2 (0.60)	...	98.0 (3.86)	7.9 (0.31)
4 × 2	31.0 (1.22)	19.1 (0.75)	15.2 (0.60)	...	83.3 (3.28)	7.9 (0.31)
4 × 1½	31.0 (1.22)	17.8 (0.70)	15.2 (0.60)	...	68.1 (2.68)	7.9 (0.31)
4 × 1¼	31.0 (1.22)	17.0 (0.67)	15.2 (0.60)	...	60.7 (2.39)	7.9 (0.31)
4 × 1	31.0 (1.22)	14.7 (0.58)	15.2 (0.60)	...	49.5 (1.95)	7.9 (0.31)
5 × 4	33.3 (1.31)	27.4 (1.08)	12.7 (0.50)	147.1 (5.79)	...	...
5 × 3½	33.3 (1.31)	26.2 (1.03)	15.2 (0.60)	132.1 (5.20)	...	...
5 × 3	33.3 (1.31)	24.9 (0.98)	15.2 (0.60)	...	117.3 (4.62)	9.7 (0.38)
5 × 2½	33.3 (1.31)	23.4 (0.92)	15.2 (0.60)	...	98.0 (3.86)	9.7 (0.38)
5 × 2	33.3 (1.31)	19.1 (0.75)	15.2 (0.60)	...	83.3 (3.28)	9.7 (0.38)
6 × 5	35.6 (1.40)	30.0 (1.18)	16.0 (0.63)	179.1 (7.05)	...	...
6 × 4	35.6 (1.40)	27.4 (1.08)	19.1 (0.75)	...	147.1 (5.79)	10.9 (0.43)
6 × 3½	35.6 (1.40)	26.2 (1.03)	19.1 (0.75)	...	132.1 (5.20)	10.9 (0.43)
6 × 3	35.6 (1.40)	24.9 (0.98)	19.1 (0.75)	...	117.3 (4.62)	10.9 (0.43)
6 × 2½	35.6 (1.40)	23.4 (0.92)	19.1 (0.75)	...	98.0 (3.86)	10.9 (0.43)
6 × 2	35.6 (1.40)	19.1 (0.75)	19.1 (0.75)	...	83.3 (3.28)	10.9 (0.43)
8 × 6	39.9 (1.57)	32.5 (1.28)	21.1 (0.83)	210.3 (8.28)	...	...
8 × 5	39.9 (1.57)	30.0 (1.18)	21.1 (0.83)	...	179.1 (7.05)	14.0 (0.55)
8 × 4	39.9 (1.57)	27.4 (1.08)	21.1 (0.83)	...	147.1 (5.79)	14.0 (0.55)

Table 7-4 Dimensions of Outside Head, Inside Head, and Face Bushings (Cont'd)

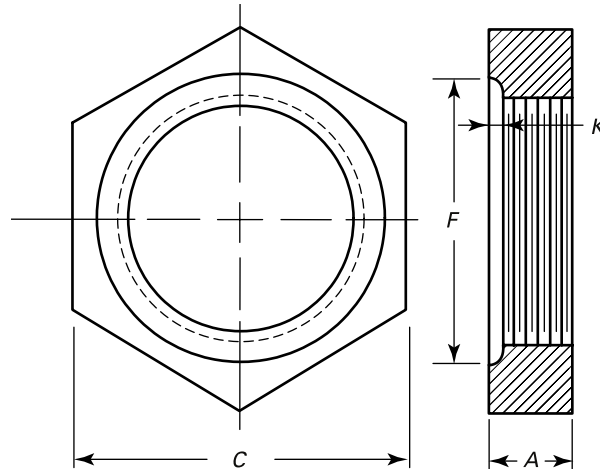
NPS [Note (1)]	Minimum Length of External Thread, A, mm (in.) [Note (2)]	Minimum Length of Internal Thread, T, mm (in.)	Minimum Height of Head, D, mm (in.)	Minimum Width of Head, C, mm (in.) [Note (3)]		Nominal Metal Thickness, G, mm (in.) [Note (4)]
				Outside	Inside	
8 × 3½	39.9 (1.57)	26.2 (1.03)	21.1 (0.83)	...	132.1 (5.20)	14.0 (0.55)
8 × 3	39.9 (1.57)	24.9 (0.98)	21.1 (0.83)	...	117.3 (4.62)	14.0 (0.55)

GENERAL NOTE: Cored bushings have minimum metal thickness at all points equal to dimension *G*, except at the end of the thread.

NOTES:

- (1) Hexagon head or octagon head bushings NPS 2½ and smaller reducing one NPS shall not be made of gray cast iron. Other NPS may be made of either cast iron or malleable iron, ductile iron, or steel. Face bushings NPS 2½ and smaller shall not be made of gray cast iron. Face bushings NPS 3 and larger reducing one NPS shall not be made of gray cast iron. Face bushings NPS 3 and larger reducing two NPS or more may be made of either cast or malleable iron, ductile iron, or steel.
- (2) In the case of outside head bushings, length *A* includes provisions for imperfect threads (see also [section 8](#)).
- (3) Heads of bushings shall be hexagonal or octagonal, except that on the larger sizes of outside head bushings, the heads may be made round with lugs instead of hexagonal or octagonal.
- (4) *G* is the same as metal thickness for Class 125 Cast Iron Threaded Fittings (ASME B16.4). For tolerance, see [para. 7\(b\)](#).
- (5) To provide proper metal thickness, these NPS shall not be cored out to diameters greater than the root diameter of the internal thread. The length of the internal thread may be equal to the minimum dimension, *T*, or greater up to the full length of bushing.
- (6) When made of bar stock, the dimensions may be 5/8 in., 11/16 in., 7/8 in., 1 1/8 in., and 1 7/16 in., respectively, in order to use regular bar stock sizes.

Table 7-5 Dimensions of Locknuts



NPS	Minimum Nominal Thickness, A, mm (in.)	Minimum Width Across Flats, C, mm (in.) [Note (1)]		Minimum Diameter of Packing Recess, F, mm (in.) [Note (2)]	Depth of Packing Recess, K, mm (in.) [Note (2)]
		Malleable Iron, Ductile Iron, Steel	Cast Iron		
1/8	4.8 (0.19)	17.5 (0.69) [Note (3)]	...	12.7 (0.50)	1.0 (0.04)
1/4	6.4 (0.25)	21.3 (0.84) [Note (3)]	...	16.8 (0.66)	1.5 (0.06)
3/8	7.1 (0.28)	25.4 (1.00) [Note (3)]	...	19.6 (0.77)	1.5 (0.06)
1/2	7.9 (0.31)	30.0 (1.18) [Note (3)]	...	24.6 (0.97)	1.5 (0.06)
3/4	8.6 (0.34)	36.3 (1.43) [Note (3)]	...	31.2 (1.23)	1.5 (0.06)
1	9.7 (0.38)	44.5 (1.75)	...	38.1 (1.50)	1.5 (0.06)
1 1/4	10.7 (0.42)	53.3 (2.10)	...	47.2 (1.86)	1.5 (0.06)
1 1/2	11.9 (0.47)	59.7 (2.35)	...	53.9 (2.12)	1.5 (0.06)
2	13.5 (0.53)	73.2 (2.88)	...	66.8 (2.63)	2.3 (0.09)
2 1/2	15.0 (0.59)	88.9 (3.50)	98.0 (3.86)	80.8 (3.18)	2.3 (0.09)
3	17.0 (0.67)	108.5 (4.27)	117.3 (4.62)	97.5 (3.84)	2.3 (0.09)
3 1/2	18.5 (0.73)	122.9 (4.84)	132.1 (5.20)	111.3 (4.38)	3.3 (0.13)
4	20.3 (0.80)	136.7 (5.38)	147.1 (5.79)	127.0 (5.00)	3.3 (0.13)

NOTES:

- (1) NPS 3 1/2 and smaller are hexagonal; NPS 4 may be either hexagonal or octagonal.
- (2) The packing recess surface may be as cast. When made from bar stock, the recess may be tool finished.
- (3) Locknuts in these NPS may be made from bar stock, in which case dimension C may be 1 1/16 in., 7/8 in., 1 in., 1 3/16 in., and 1 7/16 in., respectively, in order to conform with regular hexagon bar stock sizes.

MANDATORY APPENDIX I REFERENCES

(18)

The following is a list of publications referenced in this Standard. Unless otherwise specified, the latest edition of ASME publications shall apply. Materials manufactured to other editions of the referenced ASTM standards shall be permitted to be used to manufacture fittings meeting the requirements of this Standard as long as the fitting manufacturer verifies the material meets the requirements of the referenced edition.

ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch)
 ASME B16.3, Malleable Iron Threaded Fittings: Classes 150 and 300
 ASME B16.4, Gray Iron Threaded Fittings: Classes 125 and 250
 ASME B18.2.1, Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
 Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990 (www.asme.org)

ASTM A126-04 (2014), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 ASTM E29-13, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
 Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 (www.astm.org)

ISO 9000:2015, Quality management systems — Fundamentals and vocabulary¹
 ISO 9001:2015, Quality management systems — Requirements¹
 ISO 9004:2009, Managing for the sustained success of an organization — A quality management approach¹
 Publisher: International Organization for Standardization (ISO) Central Secretariat, Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland (www.iso.org)

¹ May also be obtained from American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036.

NONMANDATORY APPENDIX A QUALITY SYSTEM PROGRAM

The products manufactured in accordance with this Standard shall be produced under a quality system program following the principles of an appropriate standard from the ISO 9000 series.¹ A determination of the need for registration and/or certification of the product manufacturer's quality system program by an independent organization shall be the responsibility of the manufacturer. The detailed documentation demon-

strating program compliance shall be available to the purchaser at the manufacturer's facility. A written summary description of the program utilized by the product manufacturer shall be available to the purchaser upon request. The *product manufacturer* is defined as the entity whose name, or trademark, appears on the product in accordance with the marking or identification requirements of this Standard.

¹The series is also available from the American National Standards Institute (ANSI) and the American Society for Quality (ASQ) as American National Standards that are identified by the prefix "Q," replacing the prefix "ISO." Each standard of the series is listed under References in [Mandatory Appendix I](#).

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B16 AMERICAN NATIONAL STANDARDS FOR PIPING, PIPE FLANGES, FITTINGS, AND VALVES

B16.1-2015	Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250)
B16.3-2016	Malleable Iron Threaded Fittings: Classes 150 and 300
B16.4-2016	Gray Iron Threaded Fittings: Classes 125 and 250
B16.5-2017	Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24 Metric/Inch Standard
B16.9-2018	Factory-Made Wrought Butt welding Fittings
B16.10-2017	Face-to-Face and End-to-End Dimensions of Valves
B16.11-2016	Forged Fittings, Socket-Welding and Threaded
B16.12-2009 (R2014)	Cast Iron Threaded Drainage Fittings
B16.14-2018	Ferrous Pipe Plugs, Bushings, and Locknuts With Pipe Threads
B16.15-2018	Cast Copper Alloy Threaded Fittings
B16.18-2018	Cast Copper Alloy Solder Joint Pressure Fittings
B16.20-2017	Metallic Gaskets for Pipe Flanges
B16.21-2016	Nonmetallic Flat Gaskets for Pipe Flanges
B16.22-2018	Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
B16.23-2016	Cast Copper Alloy Solder Joint Drainage Fittings: DWV
B16.24-2016	Cast Copper Alloy Pipe Flanges, Flanged Fittings, and Valves: Classes 150, 300, 600, 900, 1500, and 2500
B16.25-2017	Butt welding Ends
B16.26-2018	Cast Copper Alloy Fittings for Flared Copper Tubes
B16.29-2017	Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings — DWV
B16.33-2012 (R2017)	Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 175 psi (Sizes NPS ½ Through NPS 2)
B16.34-2017	Valves — Flanged, Threaded, and Welding End
B16.36-2015	Orifice Flanges
B16.38-2012 (R2017)	Large Metallic Valves for Gas Distribution: Manually Operated, NPS 2½ (DN 65) to NPS 12 (DN 300), 125 psig (8.6 bar) Maximum
B16.39-2014	Malleable Iron Threaded Pipe Unions: Classes 150, 250, and 300
B16.40-2013	Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems
B16.42-2016	Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300
B16.44-2012 (R2017)	Manually Operated Metallic Gas Valves for Use in Aboveground Piping Systems Up to 5 psi
B16.47-2017	Large Diameter Steel Flanges NPS 26 Through NPS 60 Metric/Inch Standard
B16.48-2015	Line Blanks
B16.49-2017	Factory-Made, Wrought Steel, Butt welding Induction Bends for Transportation and Distribution Systems
B16.50-2018	Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings
B16.51-2018	Copper and Copper Alloy Press-Connect Pressure Fittings
B16.52-2018	Forged Nonferrous Fittings, Socket-Welding and Threaded (Titanium, Titanium Alloys, Aluminum, and Aluminum Alloys)

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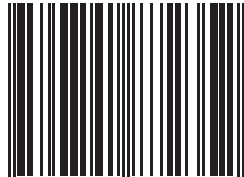
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