



**Corrosion Resistant  
Pipe Fittings,  
Threaded and Socket-Welding,  
Class 150 and 1000**

**Standard Practice**  
Developed and Approved by the  
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This MSS Standard Practice was developed under the consensus of the MSS Technical Committee 108, *Ferrous Threaded Fittings*, and the MSS Coordinating Committee. In addition, this Standard Practice was approved by an ANSI/MSS Consensus Committee and ANSI as an American National Standard. The content of this Standard Practice is the resulting efforts of knowledgeable and experienced industry volunteers to provide an effective, clear, and non-exclusive standard that will benefit the industry as a whole. This MSS Standard Practice describes minimal requirements and is intended as a basis for common practice by the manufacturer, the user, and the industry at large. The existence of an MSS Standard Practice does not in itself preclude the manufacture, sale, or use of products not conforming to the Standard Practice. Mandatory conformance to this Standard Practice is established only by reference in other documents such as a code, specification, sales contract, or public law, as applicable. MSS has no power, nor does it undertake, to enforce or certify compliance with this document. Any certification or other statement of compliance with the requirements of this Standard Practice shall not be attributable to MSS and is solely the responsibility of the certifier or maker of the statement.

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U.S. customary units in this Standard Practice are the standard. Combining or converting values between the two systems may result in non-conformance with this Standard Practice.

**This Standard Practice has been substantially revised from the previous 2007 edition. It is suggested that if the user is interested in knowing what changes have been made, that direct page by page comparison should be made of this document and that of the previous edition.**

Non-toleranced dimensions in this Standard Practice are nominal unless otherwise specified.

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## **FOREWORD**

This document established a standard for corrosion resistant pipe fittings, threaded and socket-welding. Class 150 and Class 1000, produced for a number of years by various manufacturers to somewhat different dimensions although basically similar in principle.

These fittings were originally developed for use in the paper, food, pharmaceutical, distillery, sanitary, chemical, petro-chemical, and other corrosive and high temperature industry environments. The original design of these fittings was based on the dimensions of ASME B16.3, Malleable Iron Threaded Fittings.

This Standard Practice, originally approved May 1995, was revised in 2001 to include Class 150 and Class 1000 square head plugs, hex head plugs and bushings, locknuts, and threaded and socket-welding unions.

This 2018 edition contains revisions based on (1) MSS C-108 review, and (2) comments and recommendations received during the original 2011 ANSI/MSS Consensus Committee approval process. In particular, the committee approved the inclusion of hexagonal nipples, weld spuds, and union laying length dimensions in this 2018 revision, along with revised drawings, updated data where applicable, and various editorial changes.

In 2018, this revised MSS Standard Practice was subsequently ANSI-approved as a revised American National Standard. This process involved an ANSI/MSS Consensus Committee that was composed of a diverse volunteer group of industry stakeholders with a material interest in the topic of this Standard Practice.

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Manufacturers Standardization Society of the Valve and Fittings Industry

## CORROSION RESISTANT PIPE FITTINGS, THREADED AND SOCKET-WELDING, CLASS 150 AND 1000

### 1. SCOPE

1.1 This Standard Practice for corrosion resistant pipe fittings threaded and socket-welding, Class 150 and 1000, establishes requirements for the following:

- a) Pressure-temperature ratings
- b) Size and method of designating openings of reducing fittings
- c) Marking
- d) Minimum requirements for materials
- e) Dimensions and tolerances
- f) Threading
- g) Testing

### 2. PRESSURE-TEMPERATURE RATINGS

2.1 Pressure-temperature ratings for these fittings are shown in Table 1. Ratings are independent of the contained fluid and are the maximum allowable working pressures at the tabulated temperatures. Intermediate ratings may be obtained by linear interpolation between the temperatures shown.

2.2 The temperatures shown for the corresponding pressure rating shall be the material temperature of the pressure retaining structure. It is implied that the material temperature is the same as the fluid temperature. Use of a pressure rating at a material temperature other than that of the contained fluid is the responsibility of the user and subject to the requirements of any applicable code.

2.3 For purposes of this Standard Practice, castings are included for Class 150 fittings only.

2.4 The wall thickness of the fittings covered by this Standard Practice corresponds to ASME B36.19M Schedule 40S pipe. When thinner than Schedule 40S pipe of equivalent material is used, its strength may govern the rating. When Schedule 40S or thicker pipe of equivalent material is used, the strength of the fitting governs the rating. The user bears responsibility when using thinner than Schedule 40S pipe of equivalent material.

2.4.1 In regards to the design, the pressure rating of the fitting shall not exceed those listed in Table 1 at the corresponding temperature.

### 3. SIZE

3.1 The size of the fittings listed in the following Tables is identified by the corresponding nominal<sup>(a)</sup> pipe size (i.e., NPS).

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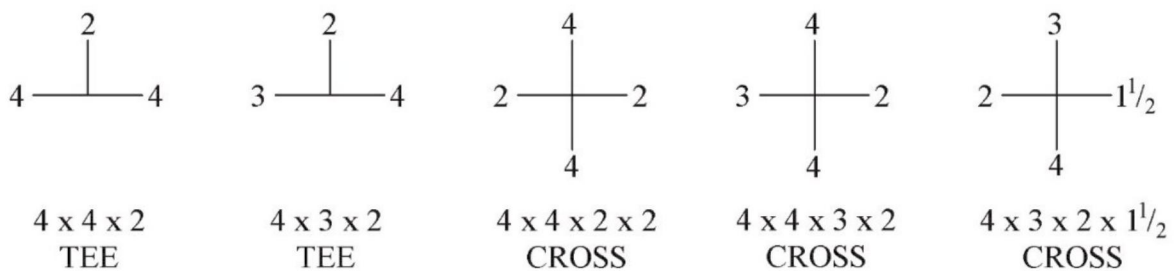
**NOTE:** (a) The use of the word “nominal” as a modifier of a dimension or size is intended to indicate that the stated dimension or size is used for purposes of designation.

**TABLE 1**  
Pressure-Temperature Ratings

Temperature (°F)	Class 150 – Castings (psig)	Class 1000 – Wrought (psig)
-20 to 150	300	1000
200	265	910
250	225	825
300	185	735
350	150 <sup>(a)</sup>	650
400	–	560
450	–	475
500	–	385
550	–	300

**NOTE:** (a) Permissible for service temperature up to 366 °F, reflecting the temperature of saturated steam at 150 psig.

3.2 For reducing tees and crosses, the size of the largest run opening shall be given first, followed by the size of the opening at the opposite end of the run. Where the fitting is a tee, the size of the outlet is given last. The straight-line sketches in Figure 1 illustrate how the reducing fittings are to be read.



**FIGURE 1**  
Identification of Reducing Fittings

#### 4. MARKING

4.1 **Class 150 Fittings** Each Class 150 fitting, as per MSS SP-25, shall be marked for identification with:

- The manufacturer's name or trademark
- Material identification/designation
- The symbol "SP114" to denote conformance with this Standard Practice
- The Rating Designation "Class 150"
- Melt identification or Heat Number
- Size
- Where size and shape of fittings do not permit all of the above markings, they may be omitted in the reverse order given.

4.2 **Class 1000 Fittings** Each Class 1000 fitting, as per MSS SP-25, shall be marked for identification with:

- a) The manufacturer's name or trademark
- b) Material identification/designation
- c) The symbol "SP114" to denote conformance with this Standard Practice
- d) The Rating Designation "Class 1000" or "1M"
- e) Melt identification or Heat Number
- f) Size
- g) Where size and shape of fittings do not permit all of the above markings, they may be omitted in the reverse order given.

## 5. **MATERIAL**

5.1 Class 150 fittings shall be cast or may be wrought. Class 1000 fittings shall be wrought only.

5.1.1 Union nuts are considered a mechanical non-wetted component of the union assembly. Therefore, union nuts of materials that meet the requirements of Section 5.2 and 5.3, other than grades used for the male and female components may be used for the nuts of union assemblies provided that atmospheric conditions permit the use of such materials.

5.2 **Castings** The chemical and mechanical properties of the castings shall be at least equal to the grades contained in ASTM A351/A351M. Castings shall be heat treated by the solution annealing method specified in ASTM A351/A351M. The castings shall be capable of passing the intergranular corrosion tests performed in accordance with "Practice B" of ASTM A262 with a corrosion rate established between the manufacturer and purchaser, or, the castings shall be capable of passing the intergranular tests performed in accordance with "Method A" of ISO 3651-2. The manufacturer shall be prepared to certify that the product has been so produced.

5.3 **Wrought** Fittings, couplings, and caps shall be made from wrought forgings, seamless tubing, or bar stock. The chemical and mechanical properties shall be as a minimum equal to the grades contained in ASTM A182/A182M, ASTM A479/A479M or ASTM A511/A511M. Wrought material shall be heat treated by the solution method as specified in ASTM A182/A182M, ASTM A479/A479M, or ASTM A511/A511M.

The wrought material shall be capable of passing the intergranular corrosion tests performed in accordance with "Practice E" of ASTM A262. The manufacturer shall be prepared to certify that the product has been so produced.

## 6. **DIMENSIONS AND TOLERANCES**

6.1 **General** The dimensions and tolerances of cast and wrought fittings are given in Tables 2 through 28.

6.2 **Reducing Fittings** Reducing fittings shall have the same center-to-end dimensions and band diameter as the straight size fittings corresponding to the largest size opening in the reducing fittings.

6.3 **Tolerances** Unless otherwise noted, the dimensions in this Standard Practice are nominal and are subject to the designated manufacturing tolerances. The following tolerances apply:

- a) **Metal Thickness** At no point shall the metal thickness of fittings shown in Tables 3, 4, 5, 9, 10, 11, and 15 be less than 90% of the values given in their respective table. Note that the 90% refers to the actual thickness of the wall of the fitting.
- b) **Center-to-End** Permitted center-to-end tolerances of fittings are shown in Table 2. Tolerances for end-to-end dimensions, lengths of couplings, and reducers shall be twice those given for center-to-end dimensions. The largest nominal pipe size in a reducing fitting governs the tolerance to be applied to all openings.



**TABLE 2**  
**Center-to-End Tolerances**

Nominal Pipe Size (NPS)	Plus or Minus (inches)
1/8, 1/4, 3/8	0.05
1/2, 3/4	0.06
1, 1 1/4	0.07
1 1/2, 2	0.08
2 1/2, 3	0.10
4	0.12

## 7. **THREADING**

**7.1 *Types of Threads*** All fittings, except locknuts, union female parts, and union nuts, shall be threaded in accordance with ASME B1.20.1, and shall have tapered threads. Locknut threads shall be NPSL straight pipe threads in accordance with ASME B1.20.1. For female union parts and union nut threads, see Section 14.2.

**7.2 *Countersink or Chamfer*** Internal 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° with the axis of the thread, and external threads shall be chamfered at an angle of 30° to 45° with the axis, both for the purpose of easier entrance in making a joint and for protection of the thread. Countersinking and chamfering shall be concentric with the threads.

### 7.3 **Thread Gaging**

**7.3.1 *Internal Threading*** All fittings with internal threads shall be threaded with American National Standard Taper Pipe Threads (ASME B1.20.1). Variations in threading shall be limited to one turn large or one turn small from the gaging notch when using working gages. 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.

**7.3.2 *External Threads*** All externally threaded fittings shall be threaded with American National Standard Taper Pipe Threads (ASME B1.20.1) and the variation in threading shall be limited to one turn large or one turn small from the gage face of ring when using working gages. 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.

**7.4 *Length*** The thread length specified in all Tables shall be measured to include the countersink or chamfer.

**7.5 *Alignment*** The maximum allowable variation in the alignment of threads of all openings of threaded fittings shall be 1/16 in./ft. (0.06 in./ft.).

## 8. SOCKET-WELDING

8.1 Dimensions for socket-welding fittings shall conform to Tables 2, 15, 16, 27, and 28.

8.2 The ends of socket-welding fittings shall be flat and at right angles to the socket axis and shall provide a minimum of 75% of the socket wall thickness for the fillet welding surface.

8.3 The socket bore shall be of uniform depth and diameter, exhibit standard professional workmanship, and a finish that is free of burrs.

## 9. RIBS

9.1 *General* The addition of ribs or lugs is permitted, as can be seen in the drawings of Tables 3, 5, 11, and 15 (“external” broken lines). Where ribs are used, it is recommended that their thickness should be the same as specified for the metal thickness of the fitting.

## 10. BUSHINGS, PLUGS, AND LOCKNUTS

10.1 For dimensions of bushings, plugs, and locknuts, see Tables 8, 9, 10, 14, 22, 23, and 24.

## 11. FACE BEVEL

11.1 A bevel not exceeding 5° is permitted on the faces of threaded fitting openings. Center-to-end, end-to-end, and width of band dimensions may include or exclude the bevel.

## 12. WELDING

12.1 Installation welding requirements are outside the scope of this Standard Practice.

## 13. TESTING

13.1 Hydrostatic testing of fittings is not required by this Standard Practice. All fittings shall be capable of withstanding, without leakage or impairment of serviceability, a hydrostatic test-pressure equal to 1½ times the pressure rating of the fitting listed in Table 1 at -20 °F to 150 °F, for the applicable class.

## 14. PIPE UNIONS

14.1 Union parts from different manufacturers are not functionally interchangeable and such usage is not recommended.

14.2 Internal threads of the nut and external threads of the female (head piece) part shall be American National Thread form made in accordance with the formulae for special threads appearing in ASME B1.1, Unified and American Screw Threads, Class 2A External and 2B Internal Tolerances and Clearances.

## Class 150

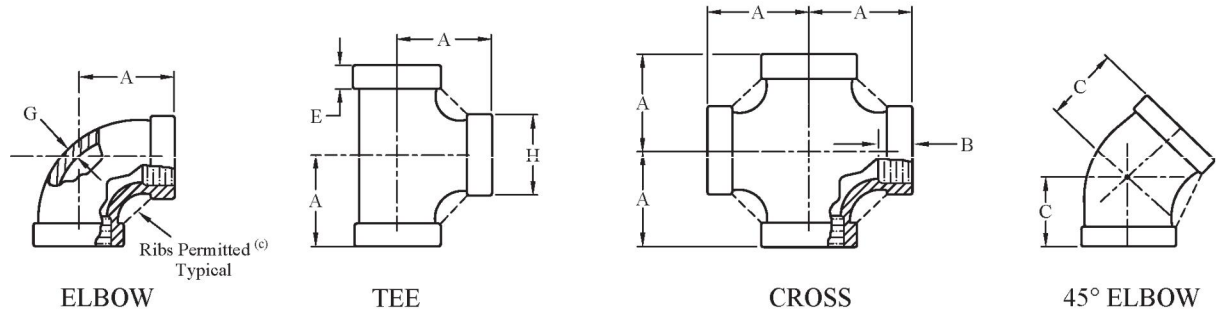


TABLE 3

## Dimensions of Class 150 Cast Threaded 90° Elbows, Tees, Crosses, and 45° Elbows

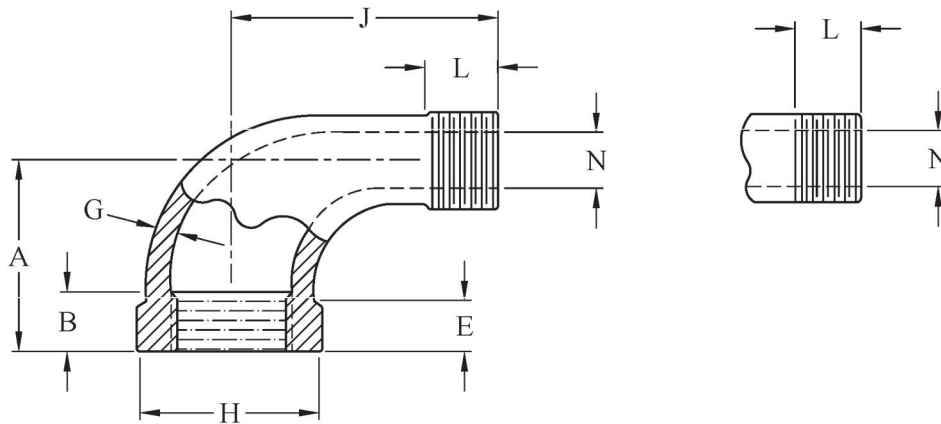
Dimensions in inches

NPS	Center-to-End, Elbows, Tees, & Crosses	Center-to-End, 45° Elbows	Length of Thread <sup>(b)</sup> (Min.)	Width of Band (Min.)	Metal Thickness <sup>(a)</sup>	Outside Diameter of Band (Min.)
	A	C	B	E	G	H
1/8	0.81	0.69	0.25	0.20	0.09	0.75
1/4	0.81	0.69	0.32	0.20	0.09	0.84
3/8	0.93	0.81	0.36	0.21	0.10	1.01
1/2	1.12	0.87	0.43	0.25	0.10	1.20
3/4	1.31	1.00	0.50	0.27	0.12	1.46
1	1.50	1.12	0.58	0.30	0.13	1.77
1¼	1.75	1.31	0.67	0.34	0.14	2.15
1½	1.93	1.43	0.70	0.37	0.15	2.43
2	2.25	1.68	0.75	0.42	0.17	2.96
2½	2.68	1.93	0.92	0.48	0.21	3.31
3	3.06	2.18	0.98	0.55	0.23	4.00
4	3.81	2.62	1.08	0.66	0.26	5.06

## NOTES:

- Patterns shall be designed to produce castings of metal thickness given in the Table. Metal thickness at no point shall be less than 90% of values given in the Table.
- The length of thread may extend beyond the width of band. However, minimum metal thickness (G) must be maintained at the end of the thread.
- Ribs are permitted as per Section 9. The applicable "external" broken lines in the drawings above indicate where ribs are allowed.

## Class 150



**TABLE 4**  
**Dimensions of Class 150 Cast Threaded 90° Street Elbows**

Dimensions in inches

NPS	Center-to-End	Length of Internal Thread <sup>(b)</sup> (Min.)	Width of Band (Min.)	Metal Thickness <sup>(a)</sup>	Outside Diameter of Band (Min.)	Center-to-End	Length of External Thread (Min.)	Port Diameter Male End (Max.)
	A	B	E	G	H	J	L	N
1/8	0.81	0.25	0.20	0.09	0.75	1.06	0.26	0.20
1/4	0.81	0.32	0.20	0.09	0.84	1.18	0.40	0.26
3/8	0.93	0.36	0.21	0.10	1.01	1.43	0.41	0.37
1/2	1.12	0.43	0.25	0.10	1.20	1.62	0.53	0.51
3/4	1.31	0.50	0.27	0.12	1.46	1.87	0.55	0.69
1	1.50	0.58	0.30	0.13	1.77	2.12	0.68	0.91
1¼	1.75	0.67	0.34	0.14	2.15	2.50	0.71	1.19
1½	1.93	0.70	0.37	0.15	2.43	2.75	0.72	1.39
2	2.25	0.75	0.42	0.17	2.96	3.25	0.76	1.79
2½	2.68	0.92	0.48	0.21	3.31	3.87	1.14	2.20
3	3.06	0.98	0.55	0.23	4.00	4.50	1.20	2.78
4	3.81	1.08	0.66	0.26	5.06	5.68	1.30	3.70

**NOTES:**

- (a) Patterns shall be designed to produce castings of metal thickness given in the Table. Metal thickness at no point shall be less than 90% of values given in the Table.
- (b) The length of thread may extend beyond the width of band. However, minimum metal thickness (G) must be maintained at the end of the thread.

## Class 150

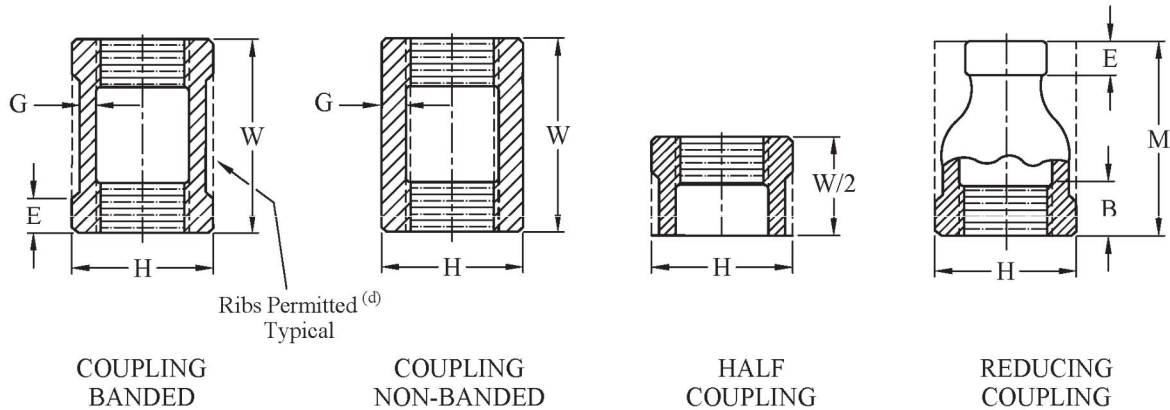


TABLE 5

## Dimensions of Class 150 Cast Threaded Couplings (Straight and Reducing Sizes)

Dimensions in inches

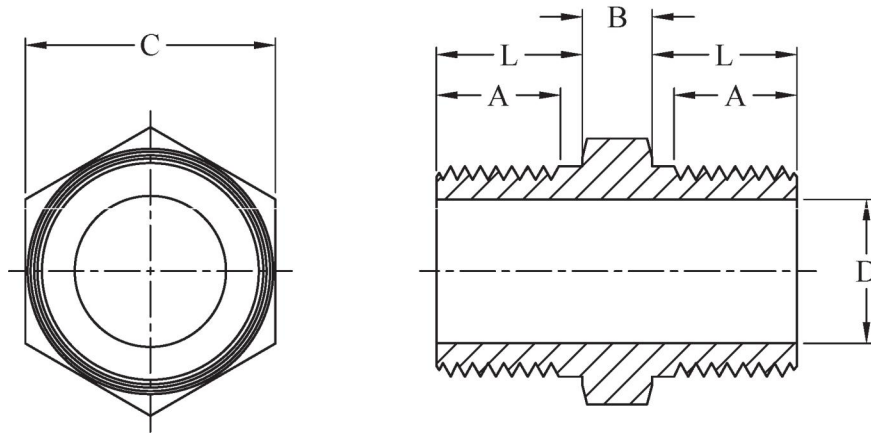
NPS	Length of Thread <sup>(b)</sup> (Min.)	Width of Band (Min.)	Metal Thickness <sup>(a)</sup>	Outside Diameter of Band <sup>(c)</sup> (Min.)	Length of Straight Couplings (Min.)	Length of Concentric Reducing Couplings (Min.)
	B	E	G	H	W	M
1/8	0.25	0.20	0.09	0.75	1.00	—
1/4	0.32	0.20	0.09	0.84	1.00	1.00
3/8	0.36	0.21	0.10	1.01	1.12	1.12
1/2	0.43	0.25	0.10	1.20	1.38	1.38
3/4	0.50	0.27	0.12	1.46	1.50	1.50
1	0.58	0.30	0.13	1.77	1.62	1.62
1¼	0.67	0.34	0.14	2.15	2.00	2.00
1½	0.70	0.37	0.15	2.43	2.12	2.12
2	0.75	0.42	0.17	2.96	2.50	2.50
2½	0.92	0.48	0.21	3.31	2.87	3.25
3	0.98	0.55	0.23	4.00	3.18	3.68
4	1.08	0.66	0.26	5.06	3.68	4.38

**GENERAL NOTE:** Reducing couplings may be either bell or straight. The outside diameter (H) of straight reducing couplings shall correspond to the largest size end connection of the reducing fitting.

**NOTES:**

- (a) Patterns shall be designed to produce castings of metal thickness given in the Table. Metal thickness at no point shall be less than 90% of values given in the Table.
- (b) The length of thread may extend beyond the width of band. However, minimum metal thickness (G) must be maintained at the end of the thread.
- (c) Couplings, half couplings and reducing couplings may be banded or non-banded.
- (d) Ribs are permitted as per Section 9. The applicable "external" broken lines in the drawings above indicate where ribs are allowed.

## Class 150



**TABLE 6**  
**Dimensions of Class 150 Cast Hexagonal Straight Nipples**

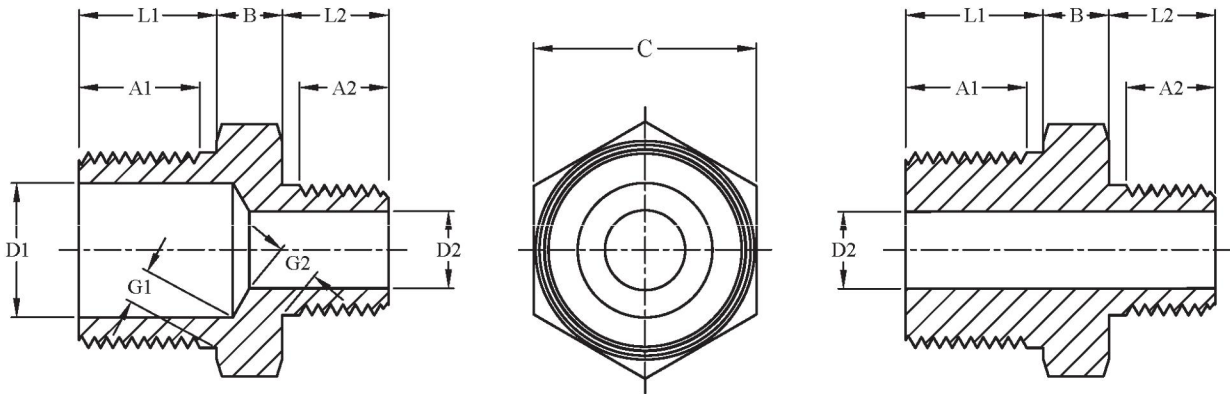
Dimensions in inches

NPS	Thread Length (Min.)	Length to Hex. (Min.)	Flat Width (Min.)	Nominal Width Across Flats <sup>(b)</sup>	Bore Diameter (Max.)
	A	L	B	C	D
1/8	0.31	0.37	0.25	7/16 <sup>(a)</sup>	0.27
1/4	0.46	0.53	0.25	5/8	0.36
3/8	0.47	0.54	0.31	11/16 <sup>(a)</sup>	0.49
1/2	0.61	0.69	0.31	7/8	0.62
3/4	0.62	0.70	0.38	1 <sup>1</sup> / <sub>16</sub> <sup>(a)</sup>	0.82
1	0.77	0.86	0.38	1 <sup>3</sup> / <sub>8</sub>	1.05
1 <sup>1</sup> / <sub>4</sub>	0.80	0.89	0.56	1 <sup>3</sup> / <sub>4</sub>	1.38
1 <sup>1</sup> / <sub>2</sub>	0.81	0.90	0.62	2	1.61
2	0.84	0.93	0.69	2 <sup>1</sup> / <sub>2</sub>	2.06
2 <sup>1</sup> / <sub>2</sub>	1.27	1.35	0.75	3	2.47
3	1.33	1.42	0.81	3 <sup>1</sup> / <sub>2</sub>	3.06
4	1.43	1.52	1.00	4 <sup>5</sup> / <sub>8</sub>	4.02

**NOTES:**

- (a) When made from bar stock; the dimensions may be 1/2, 3/4, and 1<sup>1</sup>/<sub>8</sub> inches, respectively, in order to use regular bar stock sizes.
- (b) Manufacturers applied tolerance shall assure dimensions will fit U.S. customary tooling.

**Class 150**



ALTERNATE DESIGN

**TABLE 7**  
**Dimensions of Class 150 Cast Hexagonal Reducing Nipples**

Dimensions in inches

NPS	Thread Length (Min.)	Thread Length (Min.)	Length to Hex. (Min.)	Length to Hex. (Min.)	Nominal Flat Width	Nominal Width Across Flats <sup>(b)</sup>	Bore Diameter (Max.)	Bore Diameter (Max.)	Metal Thickness (Min.)	Metal Thickness (Min.)
	A1	A2	L1	L2	B	C	D1	D2	G1	G2
1/4 x 1/8	0.46	0.31	0.53	0.37	0.25	5/8	0.36	0.27	0.21	0.16
3/8 x 1/8	0.47	0.31	0.54	0.37	0.31	11/16 <sup>(a)</sup>	0.49	0.27	0.21	0.16
3/8 x 1/4	0.47	0.46	0.54	0.53	0.31	11/16 <sup>(a)</sup>	0.49	0.36	0.21	0.21
1/2 x 1/8	0.61	0.31	0.69	0.37	0.31	7/8	0.62	0.27	0.25	0.16
1/2 x 1/4	0.61	0.46	0.69	0.53	0.31	7/8	0.62	0.36	0.25	0.21
1/2 x 3/8	0.61	0.47	0.69	0.54	0.31	7/8	0.62	0.49	0.25	0.21
3/4 x 1/8	0.62	0.31	0.70	0.37	0.38	1 1/16 <sup>(a)</sup>	0.82	0.27	0.26	0.16
3/4 x 1/4	0.62	0.46	0.70	0.53	0.38	1 1/16 <sup>(a)</sup>	0.82	0.36	0.26	0.21
3/4 x 3/8	0.62	0.47	0.70	0.54	0.38	1 1/16 <sup>(a)</sup>	0.82	0.49	0.26	0.21
3/4 x 1/2	0.62	0.61	0.70	0.69	0.38	1 1/16 <sup>(a)</sup>	0.82	0.62	0.26	0.25
1 x 1/8	0.77	0.31	0.86	0.37	0.38	1 3/8	1.05	0.27	0.30	0.16
1 x 1/4	0.77	0.46	0.86	0.53	0.38	1 3/8	1.05	0.36	0.30	0.21
1 x 3/8	0.77	0.47	0.86	0.54	0.38	1 3/8	1.05	0.49	0.30	0.21
1 x 1/2	0.77	0.61	0.86	0.69	0.38	1 3/8	1.05	0.62	0.30	0.25
1 x 3/4	0.77	0.62	0.86	0.70	0.38	1 3/8	1.05	0.82	0.30	0.26
1 1/4 x 1/4	0.80	0.46	0.89	0.53	0.56	1 3/4	1.38	0.36	0.32	0.21
1 1/4 x 3/8	0.80	0.47	0.89	0.54	0.56	1 3/4	1.38	0.49	0.32	0.21
1 1/4 x 1/2	0.80	0.61	0.89	0.69	0.56	1 3/4	1.38	0.62	0.32	0.25
1 1/4 x 3/4	0.80	0.62	0.89	0.70	0.56	1 3/4	1.38	0.82	0.32	0.26
1 1/4 x 1	0.80	0.77	0.89	0.86	0.56	1 3/4	1.38	1.05	0.32	0.30

(continued on next page)

**TABLE 7**  
**Dimensions of Class 150 Cast Hexagonal Reducing Nipples**  
*(continued)*

Dimensions in inches

NPS	Thread Length (Min.)	Thread Length (Min.)	Length to Hex. (Min.)	Length to Hex. (Min.)	Nominal Flat Width	Nominal Width Across Flats <sup>(b)</sup>	Bore Diameter (Max.)	Bore Diameter (Max.)	Metal Thickness (Min.)	Metal Thickness (Min.)
	A1	A2	L1	L2	B	C	D1	D2	G1	G2
1½ x 1/4	0.81	0.46	0.90	0.53	0.62	2	1.61	0.36	0.33	0.21
1½ x 3/8	0.81	0.47	0.90	0.54	0.62	2	1.61	0.49	0.33	0.21
1½ x 1/2	0.81	0.61	0.90	0.69	0.62	2	1.61	0.62	0.33	0.25
1½ x 3/4	0.81	0.62	0.90	0.70	0.62	2	1.61	0.82	0.33	0.26
1½ x 1	0.81	0.77	0.90	0.86	0.62	2	1.61	1.05	0.33	0.30
1½ x 1¼	0.81	0.80	0.90	0.89	0.62	2	1.61	1.38	0.33	0.32
2 x 1/4	0.84	0.46	0.93	0.53	0.69	2½	2.06	0.36	0.35	0.21
2 x 3/8	0.84	0.47	0.93	0.54	0.69	2½	2.06	0.49	0.35	0.21
2 x 1/2	0.84	0.61	0.93	0.69	0.69	2½	2.06	0.62	0.35	0.25
2 x 3/4	0.84	0.62	0.93	0.70	0.69	2½	2.06	0.82	0.35	0.26
2 x 1	0.84	0.77	0.93	0.86	0.69	2½	2.06	1.05	0.35	0.30
2 x 1¼	0.84	0.80	0.93	0.89	0.69	2½	2.06	1.38	0.35	0.32
2 x 1½	0.84	0.81	0.93	0.90	0.69	2½	2.06	1.61	0.35	0.33
2½ x 1/2	1.27	0.61	1.35	0.69	0.75	3	2.47	0.62	0.46	0.25
2½ x 3/4	1.27	0.62	1.35	0.70	0.75	3	2.47	0.82	0.46	0.26
2½ x 1	1.27	0.77	1.35	0.86	0.75	3	2.47	1.05	0.46	0.30
2½ x 1¼	1.27	0.80	1.35	0.89	0.75	3	2.47	1.38	0.46	0.32
2½ x 1½	1.27	0.81	1.35	0.90	0.75	3	2.47	1.61	0.46	0.33
2½ x 2	1.27	0.84	1.35	0.93	0.75	3	2.47	2.06	0.46	0.35
3 x 1/2	1.33	0.61	1.42	0.69	0.81	3½	3.06	0.62	0.49	0.25
3 x 3/4	1.33	0.62	1.42	0.70	0.81	3½	3.06	0.82	0.49	0.26
3 x 1	1.33	0.77	1.42	0.86	0.81	3½	3.06	1.05	0.49	0.30
3 x 1¼	1.33	0.80	1.42	0.89	0.81	3½	3.06	1.38	0.49	0.32
3 x 1½	1.33	0.81	1.42	0.90	0.81	3½	3.06	1.61	0.49	0.33
3 x 2	1.33	0.84	1.42	0.93	0.81	3½	3.06	2.06	0.49	0.35
3 x 2½	1.33	1.27	1.42	1.35	0.81	3½	3.06	2.47	0.49	0.46
4 x 1	1.43	0.77	1.52	0.86	1.00	4 <sup>5</sup> / <sub>8</sub>	4.02	1.05	0.53	0.30
4 x 1¼	1.43	0.80	1.52	0.89	1.00	4 <sup>5</sup> / <sub>8</sub>	4.02	1.38	0.53	0.32
4 x 1½	1.43	0.81	1.52	0.90	1.00	4 <sup>5</sup> / <sub>8</sub>	4.02	1.61	0.53	0.33
4 x 2	1.43	0.84	1.52	0.93	1.00	4 <sup>5</sup> / <sub>8</sub>	4.02	2.06	0.53	0.35
4 x 2½	1.43	1.27	1.52	1.35	1.00	4 <sup>5</sup> / <sub>8</sub>	4.02	2.47	0.53	0.46
4 x 3	1.43	1.33	1.52	1.42	1.00	4 <sup>5</sup> / <sub>8</sub>	4.02	3.06	0.53	0.49

**NOTES:**

- (a) When made from bar stock; the dimensions may be 3/4 and 1½ inches, respectively, in order to use regular bar stock sizes.
- (b) Manufacturers applied tolerance shall assure dimensions will fit U.S. customary tooling.



## Class 150

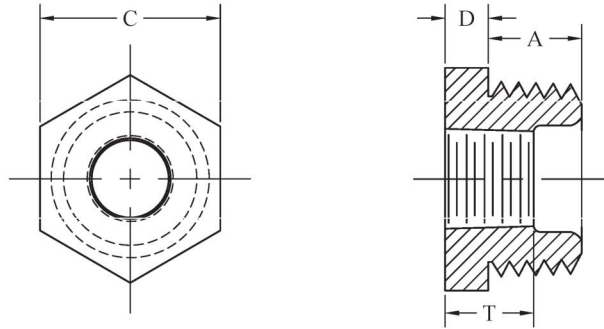


TABLE 8

## Dimensions of Class 150 Cast Threaded Hex Head Bushings

Dimensions in inches

NPS	Length of External Thread (Min.)	Length of Internal Thread (Min.)	Height of Head (Min.)	Nominal Width Across Flats <sup>(b)</sup>
	A	T	D	C
1/4 x 1/8	0.44	0.26	0.12	5/8
3/8 x 1/8	0.50	0.26	0.16	11/16 <sup>(a)</sup>
3/8 x 1/4	0.50	0.40	0.16	11/16 <sup>(a)</sup>
1/2 x 1/8	0.56	0.26	0.19	7/8
1/2 x 1/4	0.56	0.40	0.19	7/8
1/2 x 3/8	0.56	0.41	0.19	7/8
3/4 x 1/8	0.62	0.26	0.22	1 <sup>1</sup> / <sub>16</sub> <sup>(a)</sup>
3/4 x 1/4	0.62	0.40	0.22	1 <sup>1</sup> / <sub>16</sub> <sup>(a)</sup>
3/4 x 3/8	0.62	0.41	0.22	1 <sup>1</sup> / <sub>16</sub> <sup>(a)</sup>
3/4 x 1/2	0.62	0.53	0.22	1 <sup>1</sup> / <sub>16</sub> <sup>(a)</sup>
1 x 1/8	0.75	0.26	0.25	1 <sup>3</sup> / <sub>8</sub>
1 x 1/4	0.75	0.40	0.25	1 <sup>3</sup> / <sub>8</sub>
1 x 3/8	0.75	0.41	0.25	1 <sup>3</sup> / <sub>8</sub>
1 x 1/2	0.75	0.53	0.25	1 <sup>3</sup> / <sub>8</sub>
1 x 3/4	0.75	0.55	0.25	1 <sup>3</sup> / <sub>8</sub>
1 <sup>1</sup> / <sub>4</sub> x 1/4	0.81	0.40	0.28	1 <sup>3</sup> / <sub>4</sub>
1 <sup>1</sup> / <sub>4</sub> x 3/8	0.81	0.41	0.28	1 <sup>3</sup> / <sub>4</sub>
1 <sup>1</sup> / <sub>4</sub> x 1/2	0.81	0.53	0.28	1 <sup>3</sup> / <sub>4</sub>
1 <sup>1</sup> / <sub>4</sub> x 3/4	0.81	0.55	0.28	1 <sup>3</sup> / <sub>4</sub>
1 <sup>1</sup> / <sub>4</sub> x 1	0.81	0.68	0.28	1 <sup>3</sup> / <sub>4</sub>
1 <sup>1</sup> / <sub>2</sub> x 1/4	0.81	0.40	0.31	2
1 <sup>1</sup> / <sub>2</sub> x 3/8	0.81	0.41	0.31	2
1 <sup>1</sup> / <sub>2</sub> x 1/2	0.81	0.53	0.31	2
1 <sup>1</sup> / <sub>2</sub> x 3/4	0.81	0.55	0.31	2
1 <sup>1</sup> / <sub>2</sub> x 1	0.81	0.68	0.31	2
1 <sup>1</sup> / <sub>2</sub> x 1 <sup>1</sup> / <sub>4</sub>	0.81	0.71	0.31	2

(continued on next page)

**TABLE 8**  
**Dimensions of Class 150 Cast Threaded Hex Head Bushings**  
*(continued)*

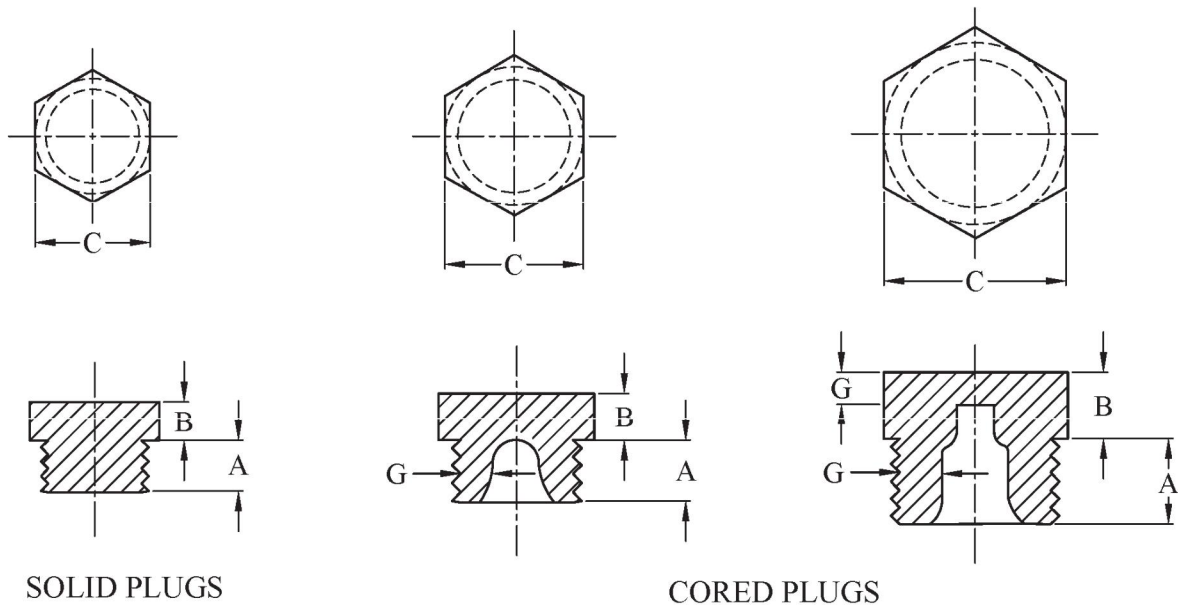
Dimensions in inches

NPS	Length of External Thread (Min.)	Length of Internal Thread (Min.)	Height of Head (Min.)	Nominal Width Across Flats <sup>(b)</sup>
	A	T	D	C
2 x 1/4	0.88	0.40	0.34	2½
2 x 3/8	0.88	0.41	0.34	2½
2 x 1/2	0.88	0.53	0.34	2½
2 x 3/4	0.88	0.55	0.34	2½
2 x 1	0.88	0.68	0.34	2½
2 x 1¼	0.88	0.71	0.34	2½
2 x 1½	0.88	0.72	0.34	2½
2½ x 1/2	1.06	0.53	0.38	3
2½ x 3/4	1.06	0.55	0.38	3
2½ x 1	1.06	0.68	0.38	3
2½ x 1¼	1.06	0.71	0.38	3
2½ x 1½	1.06	0.72	0.38	3
2½ x 2	1.06	0.76	0.38	3
3 x 1/2	1.12	0.53	0.41	3½
3 x 3/4	1.12	0.55	0.41	3½
3 x 1	1.12	0.68	0.41	3½
3 x 1¼	1.12	0.71	0.41	3½
3 x 1½	1.12	0.72	0.41	3½
3 x 2	1.12	0.76	0.41	3½
3 x 2½	1.12	1.14	0.41	3½
4 x 1	1.25	0.68	0.50	4 <sup>5</sup> / <sub>8</sub>
4 x 1¼	1.25	0.71	0.50	4 <sup>5</sup> / <sub>8</sub>
4 x 1½	1.25	0.72	0.50	4 <sup>5</sup> / <sub>8</sub>
4 x 2	1.25	0.76	0.50	4 <sup>5</sup> / <sub>8</sub>
4 x 2½	1.25	1.14	0.50	4 <sup>5</sup> / <sub>8</sub>
4 x 3	1.25	1.20	0.50	4 <sup>5</sup> / <sub>8</sub>

**NOTES:**

- (a) When made from bar stock; the dimensions may be 3/4 and 1/8 inches, respectively, in order to use regular bar stock sizes.
- (b) Manufacturers applied tolerance shall assure dimensions will fit U.S. customary tooling.

## Class 150



**TABLE 9**  
**Dimensions of Class 150 Cast Threaded Hex Head Plugs**

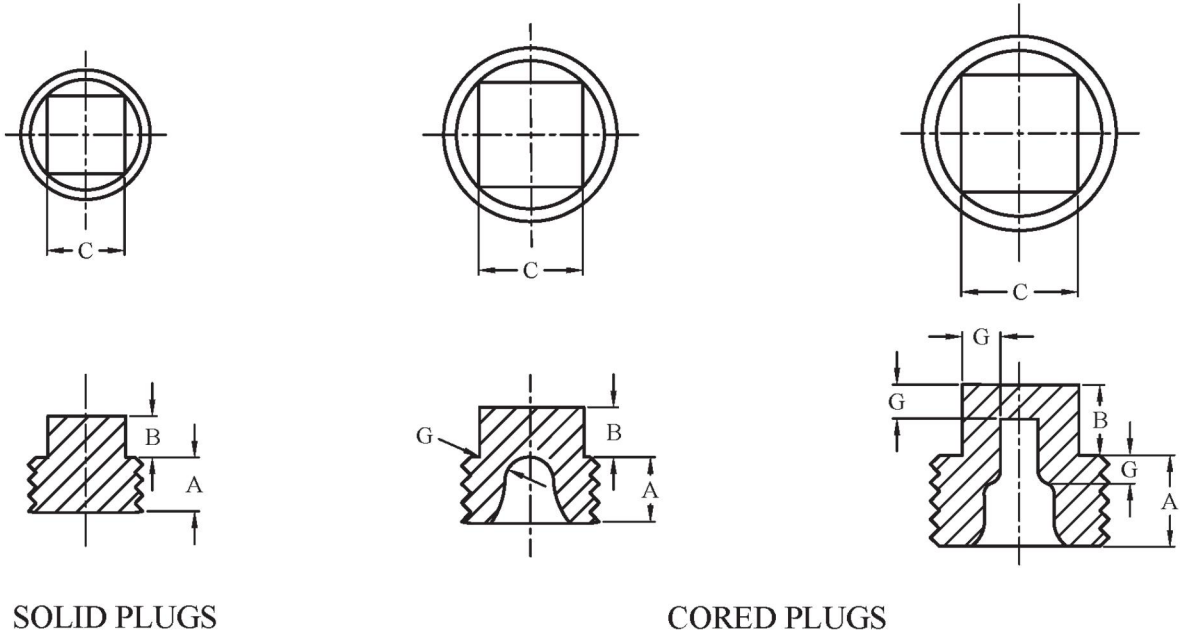
Dimensions in inches

NPS	Thread Length (Min.)	Height of Head (Min.)	Nominal Width Across Flats <sup>(c)</sup>	Metal Thickness <sup>(a)</sup>
	A	B	C	G
1/8	0.37	0.14	7/16 <sup>(b)</sup>	—
1/4	0.44	0.14	5/8	—
3/8	0.48	0.16	11/16 <sup>(b)</sup>	—
1/2	0.56	0.19	7/8	0.16
3/4	0.63	0.22	1 1/16 <sup>(b)</sup>	0.18
1	0.75	0.25	1 3/8	0.20
1 1/4	0.80	0.28	1 3/4	0.22
1 1/2	0.83	0.31	2	0.24
2	0.88	0.34	2 1/2	0.26
2 1/2	1.07	0.37	3	0.29
3	1.13	0.40	3 1/2	0.31
4	1.22	0.50	4 5/8	0.38

**NOTES:**

- Patterns shall be designed to produce castings of metal thickness given in the Table. Metal thickness at no point shall be less than 90% of values given in the Table.
- When made from bar stock; the dimensions may be 1/2, 3/4, and 1 1/8 inches, respectively, in order to use regular bar stock sizes.
- Manufacturers applied tolerance shall assure dimensions will fit U.S. customary tooling.

## Class 150



**TABLE 10**  
**Dimensions of Class 150 Cast Threaded Square Head Plugs**

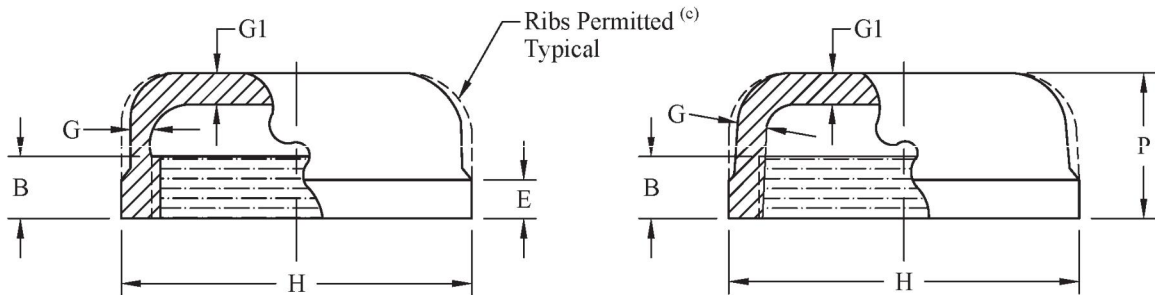
Dimensions in inches

NPS	Thread Length (Min.)	Height of Head (Min.)	Nominal Width Across Flats <sup>(b)</sup>	Metal Thickness <sup>(a)</sup>
	A	B	C	G
1/8	0.37	0.24	9/32	—
1/4	0.44	0.28	3/8	—
3/8	0.48	0.31	7/16	—
1/2	0.56	0.38	9/16	0.16
3/4	0.63	0.44	5/8	0.18
1	0.75	0.50	13/16	0.20
1¼	0.80	0.56	15/16	0.22
1½	0.83	0.62	1⅛	0.24
2	0.88	0.68	1⅝	0.26
2½	1.07	0.74	1½	0.29
3	1.13	0.80	1⅞	0.31
4	1.22	1.00	2½	0.38

**NOTES:**

- (a) Patterns shall be designed to produce castings of metal thickness given in the Table. Metal thickness at no point shall be less than 90% of values given in the Table.
- (b) Manufacturers applied tolerance shall assure dimensions will fit U.S. customary tooling.

## Class 150



**TABLE 11**  
**Dimensions of Class 150 Cast Threaded Caps**

Dimensions in inches

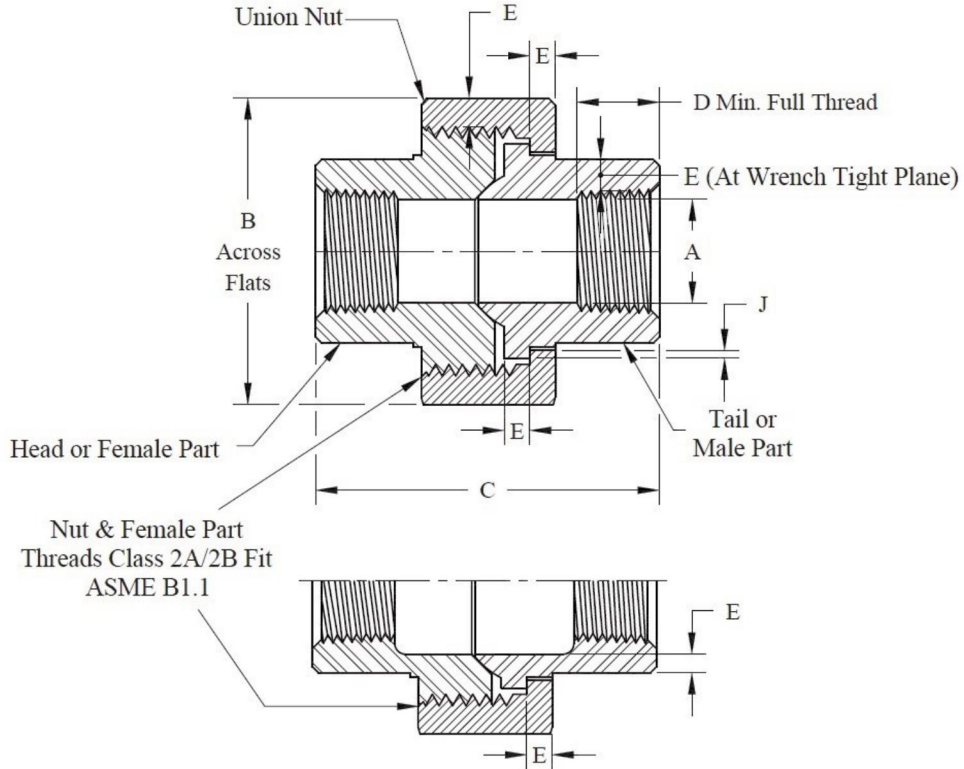
NPS	Length of Thread <sup>(b)</sup> (Min.)	Width of Band (Min.)	Metal Thickness of Side <sup>(a)</sup>	Outside Diameter of Band (Min.)	Height (Min.)	Thickness of Flat Top Caps (Min.)
	B	E	G	H	P	G1
1/8	0.25	0.20	0.09	0.75	0.68	0.09
1/4	0.32	0.20	0.09	0.84	0.68	0.09
3/8	0.36	0.21	0.10	1.01	0.81	0.10
1/2	0.43	0.25	0.10	1.20	0.93	0.12
3/4	0.50	0.27	0.12	1.46	1.06	0.13
1	0.58	0.30	0.13	1.77	1.31	0.15
1¼	0.67	0.34	0.14	2.15	1.62	0.17
1½	0.70	0.37	0.15	2.43	1.62	0.19
2	0.75	0.42	0.17	2.96	1.75	0.22
2½	0.92	0.48	0.21	3.31	2.00	0.25
3	0.98	0.55	0.23	4.00	2.25	0.29
4	1.08	0.66	0.26	5.06	2.50	0.36

**GENERAL NOTE:** Caps may be made without recess. Caps so made shall be of such height P that the length of perfect thread shall not be less than B, and the length of useful thread (B plus threads with fully formed roots and flat crests) shall be not less than L<sub>2</sub> (effective length of external thread) which is required by ASME B1.20.1.

**NOTES:**

- Patterns shall be designed to produce castings of metal thickness given in the Table. Metal thickness at no point shall be less than 90% of values given in the Table.
- The length of thread may extend beyond the width of band. However, minimum metal thickness (G) must be maintained at the end of the thread.
- Ribs are permitted as per Section 9. The applicable "external" broken lines in the drawings above indicate where ribs are allowed.

**Class 150**



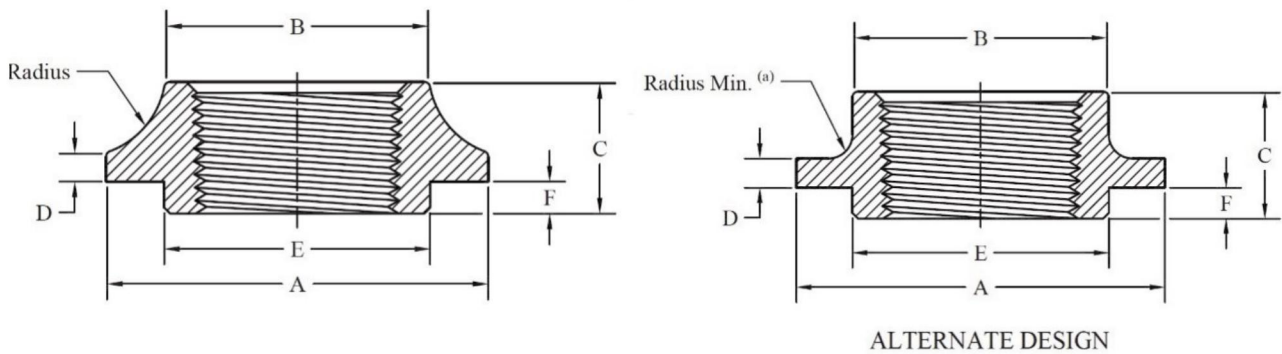
ALTERNATE DESIGN

**TABLE 12**  
**Dimensions of Class 150 Cast Threaded Unions**

Dimensions in inches

NPS	Water Way Bore (Min.)	Across Flats (Min.)	Length Assembled (Min.)	Length of Internal Thread (Min.)	Nut & Body (Min.)	Bearing (Min.)
	A	B	C	D	E	J
1/8	0.21	0.93	1.26	0.25	0.09	0.037
1/4	0.36	1.10	1.44	0.32	0.09	0.037
3/8	0.52	1.26	1.50	0.36	0.10	0.047
1/2	0.61	1.45	1.72	0.43	0.10	0.047
3/4	0.80	1.71	1.94	0.50	0.12	0.069
1	1.00	2.07	2.00	0.58	0.13	0.069
1¼	1.31	2.50	2.26	0.67	0.14	0.104
1½	1.55	2.82	2.41	0.70	0.15	0.104
2	2.03	3.41	2.75	0.75	0.17	0.104
2½	2.38	4.12	3.22	0.92	0.21	0.107
3	3.00	4.75	3.50	0.98	0.23	0.107
4	4.03	6.00	3.85	1.08	0.26	0.107

## Class 150



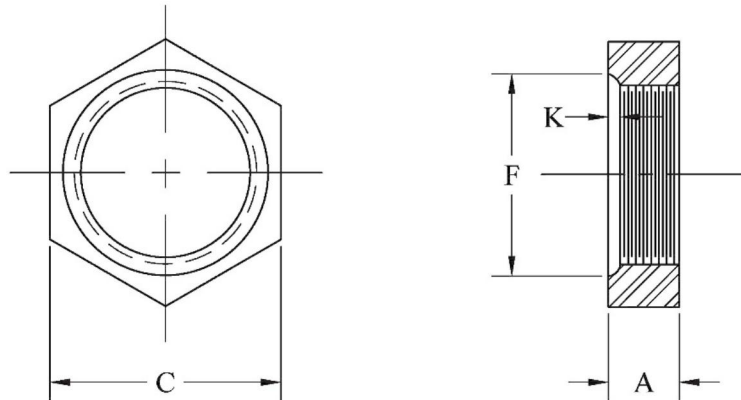
**TABLE 13**  
**Dimensions of Class 150 Cast Weld Spuds**

Dimensions in inches

NPS	Flange Diameter	Hub Diameter (Min.)	Overall Height	Flange Thickness (Min.)	Pilot Diameter ( $\pm 0.03$ )	Pilot Depth (Min.)
	A	B	C	D	E	F
1/8	1.38	0.88	0.47	0.09	0.84	0.08
1/4	1.50	1.00	0.50	0.14	0.97	0.12
3/8	1.62	1.06	0.50	0.14	0.94	0.12
1/2	1.81	1.12	0.63	0.16	1.16	0.16
3/4	2.06	1.44	0.75	0.16	1.34	0.16
1	2.38	1.75	0.83	0.20	1.70	0.19
1¼	2.50	2.13	0.88	0.20	1.94	0.19
1½	3.03	2.38	0.88	0.20	2.31	0.19
2	3.38	2.88	0.81	0.19	2.69	0.19
2½	4.06	3.31	1.00	0.22	3.19	0.19
3	4.62	3.94	1.00	0.22	3.69	0.19
4	5.81	4.94	1.25	0.22	4.75	0.19

**NOTE:** (a) Minimum radii of alternate design shown on right illustration is 0.125 inches.  
 Minimum radii of traditional design shown on the left is at the manufacturers option.

## Class 150



**TABLE 14**  
**Dimensions of Threaded Locknuts**

Dimensions in inches

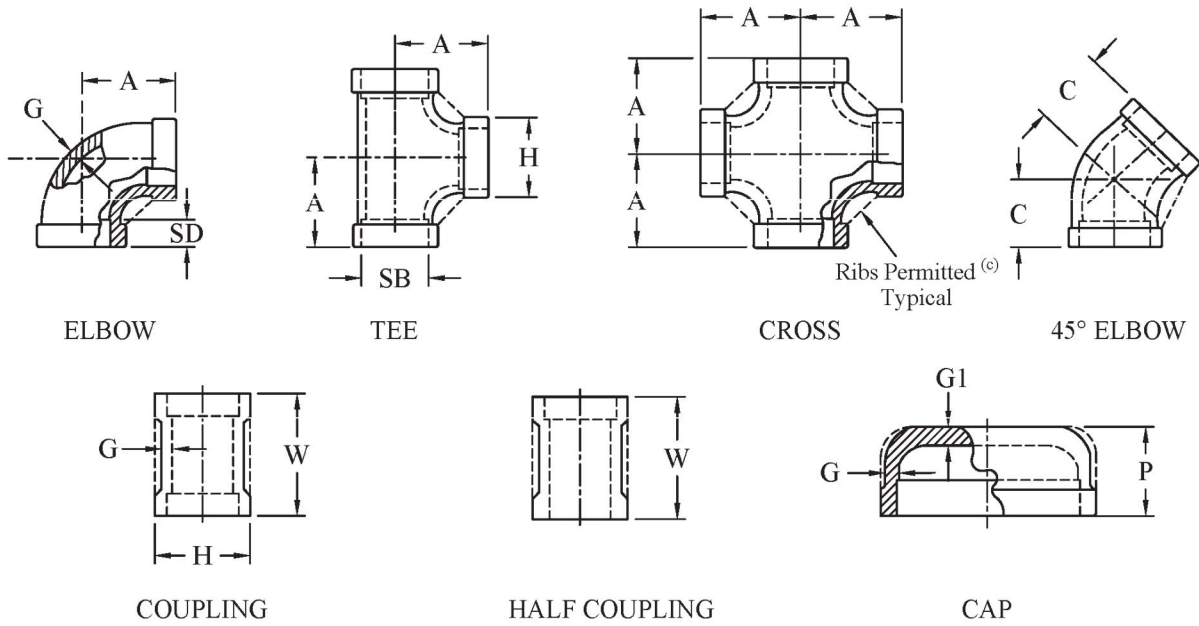
NPS	Length (Min.)	Width Across Flats (Min.)	Diameter of Packing Recess <sup>(a)</sup> (Min.)	Depth of Packing Recess <sup>(a)</sup>
	A	C	F	K
1/8	3/16	11/16	0.50	0.04
1/4	1/4	27/32	0.66	0.06
3/8	9/32	1	0.77	0.06
1/2	5/16	1 <sup>3</sup> / <sub>16</sub>	0.97	0.06
3/4	11/32	1 <sup>7</sup> / <sub>16</sub>	1.23	0.06
1	3/8	1 <sup>3</sup> / <sub>4</sub>	1.50	0.06
1 <sup>1</sup> / <sub>4</sub>	7/16	2 <sup>3</sup> / <sub>32</sub>	1.86	0.06
1 <sup>1</sup> / <sub>2</sub>	15/32	2 <sup>11</sup> / <sub>32</sub>	2.12	0.06
2	17/32	2 <sup>7</sup> / <sub>8</sub>	2.63	0.09
2 <sup>1</sup> / <sub>2</sub>	19/32	3 <sup>1</sup> / <sub>2</sub>	3.18	0.09
3	11/16	4 <sup>9</sup> / <sub>32</sub>	3.84	0.09
4	13/16	5 <sup>3</sup> / <sub>8</sub>	5.00	0.13

**GENERAL NOTE:** Threads shall be NPSL straight Pipe threads in accordance with ASME B1.20.1.

**NOTE:** (a) For castings, the packing recess may be a cast finish or a tooled finish.



**Class 150**



**TABLE 15**

**Dimensions of Class 150 Cast Socket-Welding Fittings**

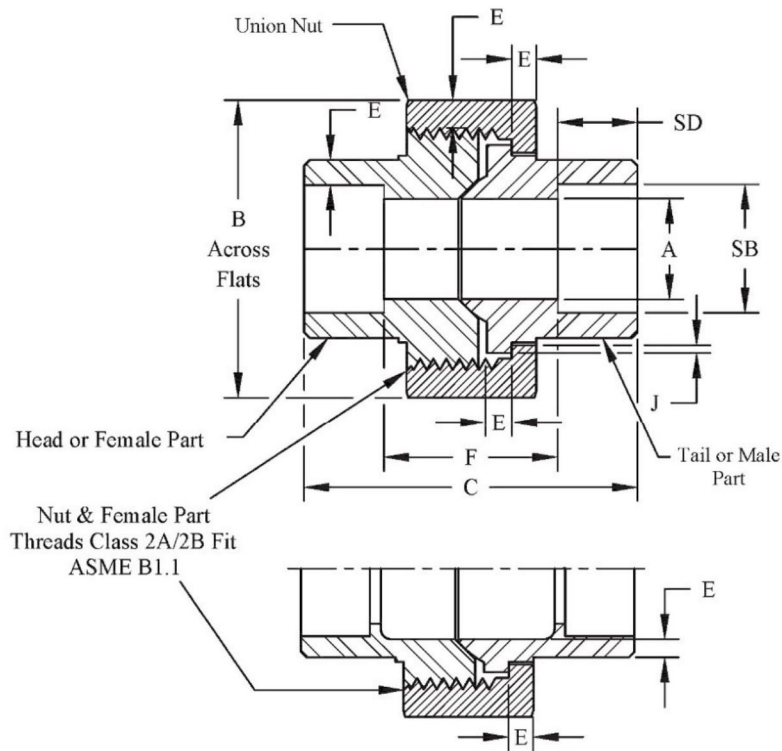
Dimensions in inches

NPS	Center-to-End Elbows, Tees, & Crosses	Center-to-End 45° Elbows	Socket Bore (Min.) / (Max.)	Socket Depth <sup>(b)</sup> (Min.)	Metal Thickness <sup>(a)</sup>	Outside Band Diameter (Min.)	Full Coupling Length (Min.)	Cap Height (Min.)	Flat Top Cap Thickness (Min.)
	A	C	SB	SD	G	H	W	P	G1
1/8	0.81	0.69	0.420 / 0.440	0.32	0.09	0.75	1.00	0.68	0.09
1/4	0.81	0.69	0.555 / 0.575	0.32	0.09	0.84	1.00	0.68	0.09
3/8	0.93	0.81	0.690 / 0.710	0.32	0.10	1.01	1.12	0.81	0.10
1/2	1.12	0.87	0.855 / 0.875	0.32	0.10	1.20	1.38	0.93	0.12
3/4	1.31	1.00	1.065 / 1.085	0.37	0.12	1.46	1.50	1.06	0.13
1	1.50	1.12	1.330 / 1.350	0.44	0.13	1.77	1.62	1.31	0.15
1¼	1.75	1.31	1.675 / 1.695	0.50	0.14	2.15	2.00	1.62	0.17
1½	1.93	1.43	1.915 / 1.935	0.50	0.15	2.43	2.12	1.62	0.19
2	2.25	1.68	2.406 / 2.426	0.56	0.17	2.96	2.50	1.75	0.22
2½	2.68	1.93	2.906 / 2.931	0.56	0.21	3.31	2.87	2.00	0.25
3	3.06	2.18	3.535 / 3.560	0.56	0.23	4.00	3.18	2.25	0.29
4	3.81	2.62	4.545 / 4.570	0.69	0.26	5.06	3.68	2.50	0.36

**NOTES:**

- (a) Patterns shall be designed to produce castings of metal thickness given in the Table. Metal thickness at no point shall be less than 90% of values given in the Table.
- (b) The depth of socket may extend beyond the width of band. However, minimum metal thickness (G) must be maintained at the bottom of the socket.
- (c) Ribs are permitted as per Section 9. The applicable "external" broken lines in the drawings above indicate where ribs are allowed.

**Class 150**



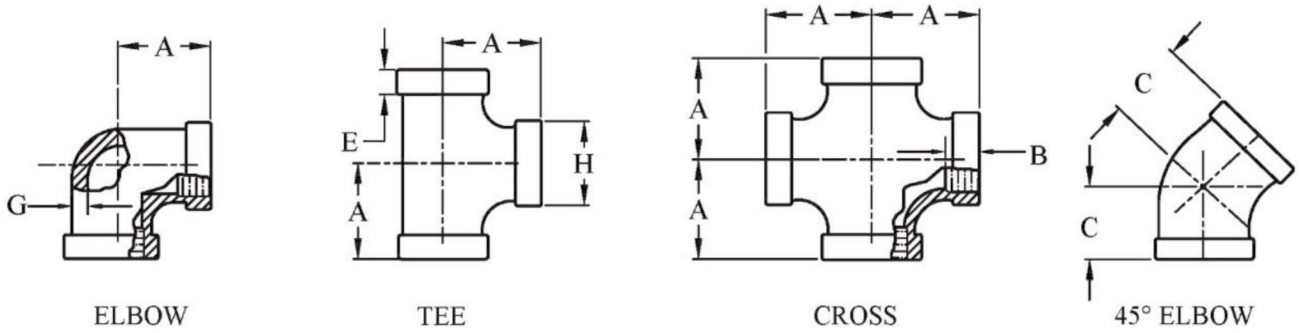
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**TABLE 16**  
**Dimensions of Class 150 Cast Socket-Welding Unions**

Dimensions in inches

NPS	Water Way Bore (Min.)	Across Flats (Min.)	Length Assembled (Min.)	Nut & Body (Min.)	Laying Length (Min.) / (Max.)	Bearing (Min.)	Socket Bore Diameter (Min.) / (Max.)	Depth of Socket (Min.)
	A	B	C	E	F	J	SB	SD
1/8	0.21	0.93	1.26	0.09	0.573 / 0.673	0.037	0.420 / 0.440	0.32
1/4	0.36	1.10	1.44	0.09	0.573 / 0.673	0.037	0.555 / 0.575	0.32
3/8	0.52	1.26	1.61	0.10	0.466 / 0.545	0.047	0.690 / 0.710	0.32
1/2	0.61	1.45	1.72	0.10	0.886 / 0.986	0.047	0.855 / 0.875	0.32
3/4	0.80	1.71	1.94	0.12	1.013 / 1.108	0.069	1.065 / 1.085	0.37
1	1.00	2.07	2.06	0.13	1.102 / 1.199	0.069	1.330 / 1.350	0.44
1 1/4	1.31	2.50	2.26	0.14	1.239 / 1.324	0.104	1.675 / 1.695	0.50
1 1/2	1.55	2.82	2.41	0.15	1.458 / 1.544	0.104	1.915 / 1.935	0.50
2	2.03	3.41	2.75	0.17	1.335 / 1.421	0.104	2.406 / 2.426	0.56
2 1/2	2.38	4.12	3.22	0.21	2.100 / 2.186	0.107	2.906 / 2.931	0.56
3	3.00	4.75	3.50	0.23	2.380 / 2.466	0.107	3.535 / 3.560	0.56
4	4.03	6.00	3.85	0.26	2.470 / 2.556	0.107	4.454 / 4.570	0.69

**Class 1000**



**TABLE 17**

**Dimensions of Class 1000 Wrought Threaded 90° Elbows, Tees, Crosses, and 45° Elbows**

Dimensions in inches

NPS	Center-to-End, Elbows Tees, & Crosses	Center-to-End, 45° Elbows	Length of Thread <sup>(a)</sup> (Min.)	Width of Band (Min.)	Metal Thickness (Min.)	Outside Diameter of Band (Min.)
	A	C	B	E	G	H
1/8	0.81	0.69	0.26	0.25	0.09	0.75
1/4	0.81	0.69	0.40	0.25	0.09	0.75
3/8	0.93	0.81	0.41	0.25	0.10	0.87
1/2	1.12	0.87	0.53	0.38	0.10	1.12
3/4	1.31	1.00	0.55	0.50	0.12	1.34

**NOTE:** (a) The length of thread may extend beyond the width of band. However, minimum metal thickness (G) must be maintained at the end of the thread.

## Class 1000

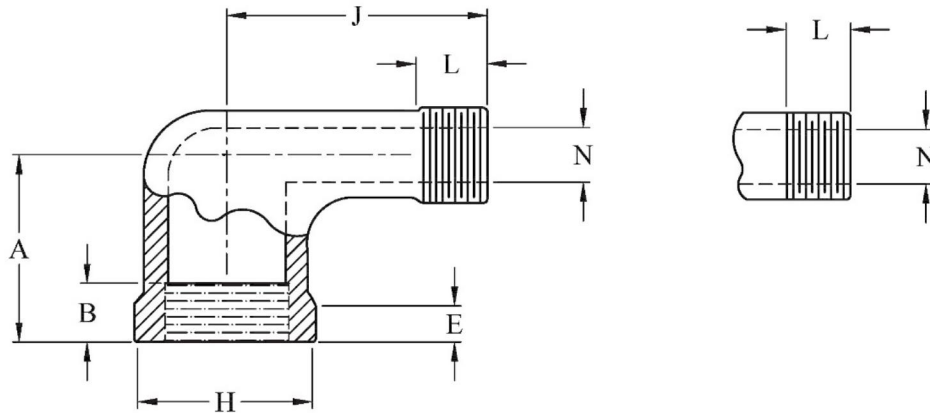


TABLE 18

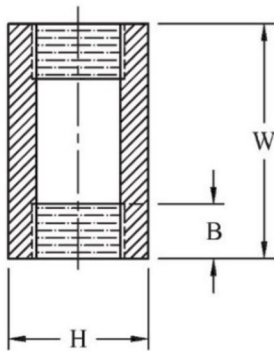
Dimensions of Class 1000 Wrought Threaded 90° Street Elbows

Dimensions in inches

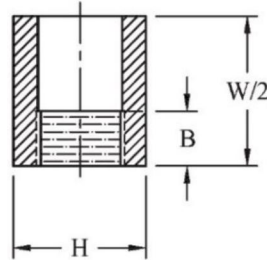
NPS	Center-to-End	Length of Internal Thread <sup>(a)</sup> (Min.)	Width of Band (Min.)	Metal Thickness (Min.)	Outside Diameter of Band (Min.)	Center-to-End	Length of External Thread (Min.)	Port Diameter Male End (Max.)
	A	B	E	G	H	J	L	N
1/8	0.75	0.26	0.21	0.09	0.75	1.06	0.26	0.18
1/4	0.81	0.40	0.21	0.09	0.87	1.18	0.40	0.25
3/8	0.97	0.41	0.23	0.10	1.01	1.43	0.41	0.37
1/2	1.12	0.53	0.25	0.10	1.21	1.62	0.53	0.50
3/4	1.31	0.55	0.27	0.12	1.37	1.87	0.55	0.62

**NOTE:** (a) The length of thread may extend beyond the width of band. However, minimum metal thickness (G) must be maintained at the end of the thread.

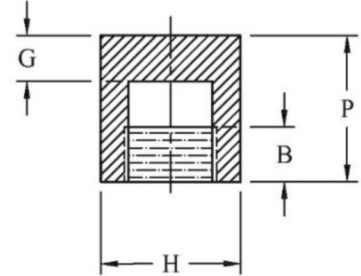
## Class 1000



COUPLING



HALF COUPLING



CAP

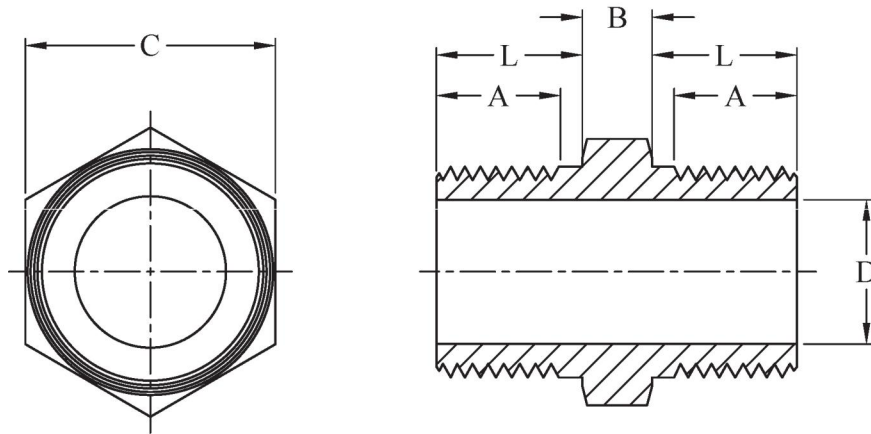
TABLE 19

Dimensions of Class 1000 Wrought Threaded Couplings (Straight and Reducing Sizes) and Caps

Dimensions in inches

NPS	Length of Thread (Min.)	Length of Couplings (Min.)	Outside Diameter (Min.)	End Wall Thickness (Min.)	Length of Cap (Min.)
	B	W	H	G	P
1/8	0.26	1.00	0.55	0.09	0.68
1/4	0.40	1.00	0.74	0.09	0.68
3/8	0.41	1.12	0.86	0.10	0.81
1/2	0.53	1.38	1.05	0.12	0.93
3/4	0.55	1.50	1.30	0.13	1.06
1	0.68	1.62	1.61	0.15	1.31
1 <sup>1</sup> / <sub>4</sub>	0.71	2.00	1.86	0.17	1.62
1 <sup>1</sup> / <sub>2</sub>	0.72	2.12	2.17	0.19	1.62
2	0.76	2.50	2.74	0.22	1.75
2 <sup>1</sup> / <sub>2</sub>	1.14	2.87	3.31	0.25	2.00
3	1.20	3.18	4.00	0.29	2.25
4	1.30	3.68	5.06	0.36	2.50

## Class 1000



**TABLE 20**  
**Dimensions of Class 1000 Wrought Hexagonal Straight Nipples**

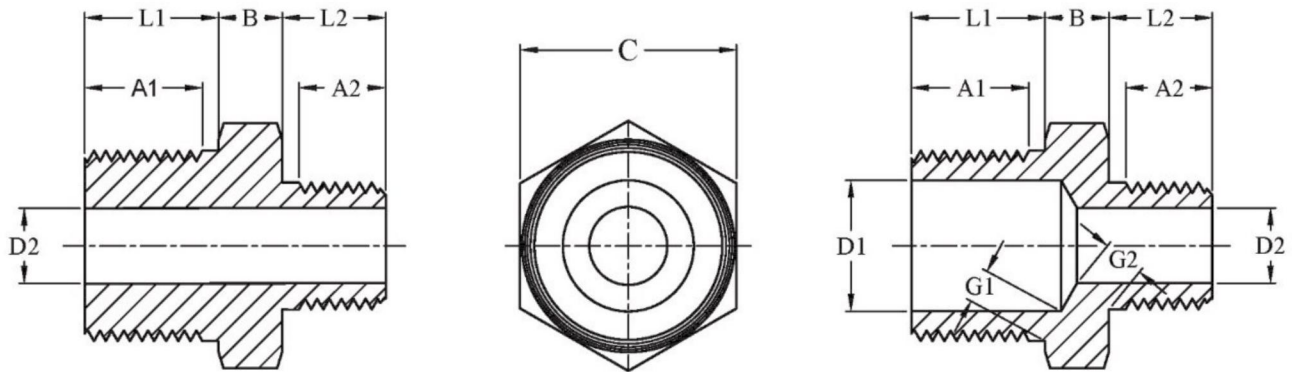
Dimensions in inches

NPS	Thread Length (Min.)	Length to Hex. (Min.)	Flat Width (Min.)	Nominal Width Across Flats <sup>(b)</sup>	Bore Diameter (Max.)
	A	L	B	C	D
1/8	0.31	0.37	0.25	7/16 <sup>(a)</sup>	0.21
1/4	0.46	0.53	0.25	5/8	0.30
3/8	0.47	0.54	0.31	11/16 <sup>(a)</sup>	0.42
1/2	0.61	0.69	0.31	7/8	0.54
3/4	0.62	0.70	0.38	1 <sup>1</sup> / <sub>16</sub> <sup>(a)</sup>	0.74
1	0.77	0.86	0.38	1 <sup>3</sup> / <sub>8</sub>	0.96
1 <sup>1</sup> / <sub>4</sub>	0.80	0.89	0.56	1 <sup>3</sup> / <sub>4</sub>	1.28
1 <sup>1</sup> / <sub>2</sub>	0.81	0.90	0.62	2	1.50
2	0.84	0.93	0.69	2 <sup>1</sup> / <sub>2</sub>	1.94
2 <sup>1</sup> / <sub>2</sub>	1.27	1.35	0.75	3	2.40
3	1.33	1.42	0.81	3 <sup>1</sup> / <sub>2</sub>	2.95
4	1.43	1.52	1.00	4 <sup>5</sup> / <sub>8</sub>	3.82

**NOTES:**

- (a) When made from bar stock; the dimensions may be 1/2, 3/4, and 1<sup>1</sup>/<sub>8</sub> inches, respectively, in order to use regular bar stock sizes.
- (b) Manufacturers applied tolerance shall assure dimensions will fit U.S. customary tooling

**Class 1000**



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**TABLE 21**  
**Dimensions of Class 1000 Wrought Hexagonal Reducing Nipples**

Dimensions in inches

NPS	Thread Length (Min.)	Thread Length (Min.)	Length to Hex. (Min.)	Length to Hex. (Min.)	Nominal Flat Width	Nominal Width Across Flats <sup>(b)</sup>	Bore Diameter (Max.)	Bore Diameter (Max.)	Metal Thickness (Min.)	Metal Thickness (Min.)
	A1	A2	L1	L2	B	C	D1	D2	G1	G2
1/4 x 1/8	0.46	0.31	0.53	0.37	0.25	5/8	0.30	0.21	0.27	0.22
3/8 x 1/8	0.47	0.31	0.54	0.37	0.31	11/16 <sup>(a)</sup>	0.42	0.21	0.28	0.22
3/8 x 1/4	0.47	0.46	0.54	0.53	0.31	11/16 <sup>(a)</sup>	0.42	0.30	0.28	0.27
1/2 x 1/8	0.61	0.31	0.69	0.37	0.31	7/8	0.52	0.21	0.33	0.22
1/2 x 1/4	0.61	0.46	0.69	0.53	0.31	7/8	0.52	0.30	0.33	0.27
1/2 x 3/8	0.61	0.47	0.69	0.54	0.31	7/8	0.52	0.42	0.33	0.28
3/4 x 1/8	0.62	0.31	0.70	0.37	0.38	1 1/16 <sup>(a)</sup>	0.74	0.21	0.34	0.22
3/4 x 1/4	0.62	0.46	0.70	0.53	0.38	1 1/16 <sup>(a)</sup>	0.74	0.30	0.34	0.27
3/4 x 3/8	0.62	0.47	0.70	0.54	0.38	1 1/16 <sup>(a)</sup>	0.74	0.42	0.34	0.28
3/4 x 1/2	0.62	0.61	0.70	0.69	0.38	1 1/16 <sup>(a)</sup>	0.74	0.54	0.34	0.33
1 x 1/8	0.77	0.31	0.86	0.37	0.38	1 3/8	0.96	0.21	0.39	0.22
1 x 1/4	0.77	0.46	0.86	0.53	0.38	1 3/8	0.96	0.30	0.39	0.27
1 x 3/8	0.77	0.47	0.86	0.54	0.38	1 3/8	0.96	0.42	0.39	0.28
1 x 1/2	0.77	0.61	0.86	0.69	0.38	1 3/8	0.96	0.54	0.39	0.33
1 x 3/4	0.77	0.62	0.86	0.70	0.38	1 3/8	0.96	0.74	0.39	0.34
1 1/4 x 1/4	0.80	0.46	0.89	0.53	0.56	1 3/4	1.28	0.30	0.42	0.27
1 1/4 x 3/8	0.80	0.47	0.89	0.54	0.56	1 3/4	1.28	0.42	0.42	0.28
1 1/4 x 1/2	0.80	0.61	0.89	0.69	0.56	1 3/4	1.28	0.54	0.42	0.33
1 1/4 x 3/4	0.80	0.62	0.89	0.70	0.56	1 3/4	1.28	0.74	0.42	0.34
1 1/4 x 1	0.80	0.77	0.89	0.86	0.56	1 3/4	1.28	0.96	0.42	0.39

(continued on next page)

**TABLE 21**  
**Dimensions of Class 1000 Wrought Hexagonal Reducing Nipples**  
*(continued)*

Dimensions in inches

NPS	Thread Length (Min.)	Thread Length (Min.)	Length to Hex. (Min.)	Length to Hex. (Min.)	Nominal Flat Width	Nominal Width Across Flats <sup>(b)</sup>	Bore Diameter (Max.)	Bore Diameter (Max.)	Metal Thickness (Min.)	Metal Thickness (Min.)
	A1	A2	L1	L2	B	C	D1	D2	G1	G2
1½ x 1/4	0.81	0.46	0.90	0.53	0.62	2	1.50	0.30	0.44	0.27
1½ x 3/8	0.81	0.46	0.90	0.53	0.62	2	1.50	0.42	0.44	0.28
1½ x 1/2	0.81	0.47	0.90	0.54	0.62	2	1.50	0.54	0.44	0.33
1½ x 3/4	0.81	0.61	0.90	0.69	0.62	2	1.50	0.74	0.44	0.34
1½ x 1	0.81	0.62	0.90	0.70	0.62	2	1.50	0.96	0.44	0.39
1½ x 1¼	0.81	0.77	0.90	0.86	0.62	2	1.50	1.28	0.44	0.42
2 x 1/4	0.84	0.46	0.93	0.53	0.69	2½	1.94	0.30	0.47	0.27
2 x 3/8	0.84	0.47	0.93	0.54	0.69	2½	1.94	0.42	0.47	0.28
2 x 1/2	0.84	0.61	0.93	0.69	0.69	2½	1.94	0.54	0.47	0.33
2 x 3/4	0.84	0.62	0.93	0.70	0.69	2½	1.94	0.74	0.47	0.34
2 x 1	0.84	0.77	0.93	0.86	0.69	2½	1.94	0.96	0.47	0.39
2 x 1¼	0.84	0.80	0.93	0.89	0.69	2½	1.94	1.28	0.47	0.42
2 x 1½	0.84	0.81	0.93	0.90	0.69	2½	1.94	1.50	0.47	0.44
2½ x 1/2	1.27	0.61	1.35	0.69	0.75	3	2.40	0.54	0.53	0.33
2½ x 3/4	1.27	0.62	1.35	0.70	0.75	3	2.40	0.74	0.53	0.34
2½ x 1	1.27	0.77	1.35	0.86	0.75	3	2.40	0.96	0.53	0.39
2½ x 1¼	1.27	0.80	1.35	0.89	0.75	3	2.40	1.28	0.53	0.42
2½ x 1½	1.27	0.81	1.35	0.90	0.75	3	2.40	1.50	0.53	0.44
2½ x 2	1.27	0.84	1.35	0.93	0.75	3	2.40	1.94	0.53	0.47
3 x 1/2	1.33	0.61	1.42	0.69	0.81	3½	2.95	0.54	0.60	0.33
3 x 3/4	1.33	0.62	1.42	0.70	0.81	3½	2.95	0.74	0.60	0.34
3 x 1	1.33	0.77	1.42	0.86	0.81	3½	2.95	0.96	0.60	0.39
3 x 1¼	1.33	0.80	1.42	0.89	0.81	3½	2.95	1.28	0.60	0.42
3 x 1½	1.33	0.81	1.42	0.90	0.81	3½	2.95	1.50	0.60	0.44
3 x 2	1.33	0.84	1.42	0.93	0.81	3½	2.95	1.94	0.60	0.47
3 x 2½	1.33	1.27	1.42	1.35	0.81	3½	2.95	2.40	0.60	0.53
4 x 1	1.43	0.77	1.52	0.86	1.00	4⅝	3.82	0.96	0.73	0.39
4 x 1¼	1.43	0.80	1.52	0.89	1.00	4⅝	3.82	1.28	0.73	0.42
4 x 1½	1.43	0.81	1.52	0.90	1.00	4⅝	3.82	1.50	0.73	0.44
4 x 2	1.43	0.84	1.52	0.93	1.00	4⅝	3.82	1.94	0.73	0.47
4 x 2½	1.43	1.27	1.52	1.35	1.00	4⅝	3.82	2.40	0.73	0.53
4 x 3	1.43	1.33	1.52	1.42	1.00	4⅝	3.82	2.95	0.73	0.60

**NOTES:**

- (a) When made from bar stock; the dimensions may be 3/4 and 1⅛ inches, respectively, in order to use regular bar stock sizes.  
 (b) Manufacturers applied tolerance shall assure dimensions will fit U.S. customary tooling.



## Class 1000

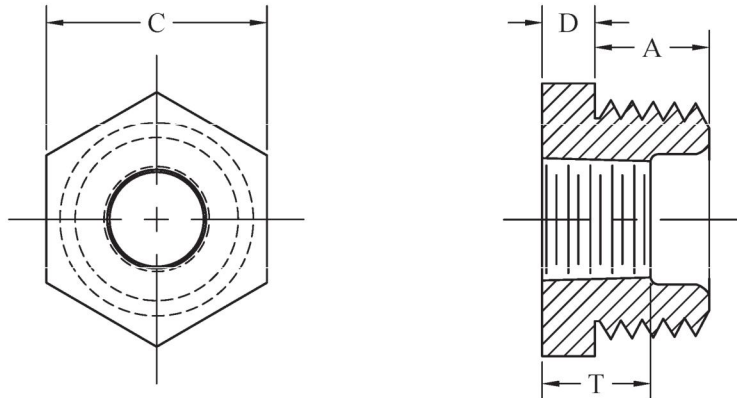


TABLE 22

## Dimensions of Class 1000 Wrought Threaded Hex Head Bushings

Dimensions in inches

NPS	Length of External Thread (Min.)	Length of Internal Thread (Min.)	Height of Head (Min.)	Nominal Width Across Flats <sup>(b)</sup>
	A	T	D	C
1/4 x 1/8	0.44	0.26	0.12	5/8
3/8 x 1/8	0.50	0.26	0.16	11/16 <sup>(a)</sup>
3/8 x 1/4	0.50	0.40	0.16	11/16 <sup>(a)</sup>
1/2 x 1/8	0.56	0.26	0.19	7/8
1/2 x 1/4	0.56	0.40	0.19	7/8
1/2 x 3/8	0.56	0.41	0.19	7/8
3/4 x 1/8	0.62	0.26	0.22	1 1/16 <sup>(a)</sup>
3/4 x 1/4	0.62	0.40	0.22	1 1/16 <sup>(a)</sup>
3/4 x 3/8	0.62	0.41	0.22	1 1/16 <sup>(a)</sup>
3/4 x 1/2	0.62	0.53	0.22	1 1/16 <sup>(a)</sup>
1 x 1/8	0.75	0.26	0.25	1 3/8
1 x 1/4	0.75	0.40	0.25	1 3/8
1 x 3/8	0.75	0.41	0.25	1 3/8
1 x 1/2	0.75	0.53	0.25	1 3/8
1 x 3/4	0.75	0.55	0.25	1 3/8
1 1/4 x 1/4	0.81	0.40	0.28	1 3/4
1 1/4 x 3/8	0.81	0.41	0.28	1 3/4
1 1/4 x 1/2	0.81	0.53	0.28	1 3/4
1 1/4 x 3/4	0.81	0.55	0.28	1 3/4
1 1/4 x 1	0.81	0.68	0.28	1 3/4
1 1/2 x 1/4	0.81	0.40	0.31	2
1 1/2 x 3/8	0.81	0.41	0.31	2
1 1/2 x 1/2	0.81	0.53	0.31	2
1 1/2 x 3/4	0.81	0.55	0.31	2
1 1/2 x 1	0.81	0.68	0.31	2
1 1/2 x 1 1/4	0.81	0.71	0.31	2

(continued on next page)

**TABLE 22**  
**Dimensions of Class 1000 Wrought Threaded Hex Head Bushings**  
*(continued)*

Dimensions in inches

NPS	Length of External Thread (Min.)	Length of Internal Thread (Min.)	Height of Head (Min.)	Nominal Width Across Flats <sup>(b)</sup>
	A	T	D	C
2 x 1/4	0.88	0.40	0.34	2½
2 x 3/8	0.88	0.41	0.34	2½
2 x 1/2	0.88	0.53	0.34	2½
2 x 3/4	0.88	0.55	0.34	2½
2 x 1	0.88	0.68	0.34	2½
2 x 1¼	0.88	0.71	0.34	2½
2 x 1½	0.88	0.72	0.34	2½
2½ x 1/2	1.06	0.53	0.38	3
2½ x 3/4	1.06	0.55	0.38	3
2½ x 1	1.06	0.68	0.38	3
2½ x 1¼	1.06	0.71	0.38	3
2½ x 1½	1.06	0.72	0.38	3
2½ x 2	1.06	0.76	0.38	3
3 x 1/2	1.12	0.53	0.41	3½
3 x 3/4	1.12	0.55	0.41	3½
3 x 1	1.12	0.68	0.41	3½
3 x 1¼	1.12	0.71	0.41	3½
3 x 1½	1.12	0.72	0.41	3½
3 x 2	1.12	0.76	0.41	3½
3 x 2½	1.12	1.14	0.41	3½
4 x 1	1.25	0.68	0.50	4⅝
4 x 1¼	1.25	0.71	0.50	4⅝
4 x 1½	1.25	0.72	0.50	4⅝
4 x 2	1.25	0.76	0.50	4⅝
4 x 2½	1.25	1.14	0.50	4⅝
4 x 3	1.25	1.20	0.50	4⅝

**NOTES:**

- (a) When made from bar stock; the dimensions may be 3/4 and 1⅛ inches, respectively, in order to use regular bar stock sizes.
- (b) Manufacturers applied tolerance shall assure dimensions will fit U.S. customary tooling.

## Class 1000

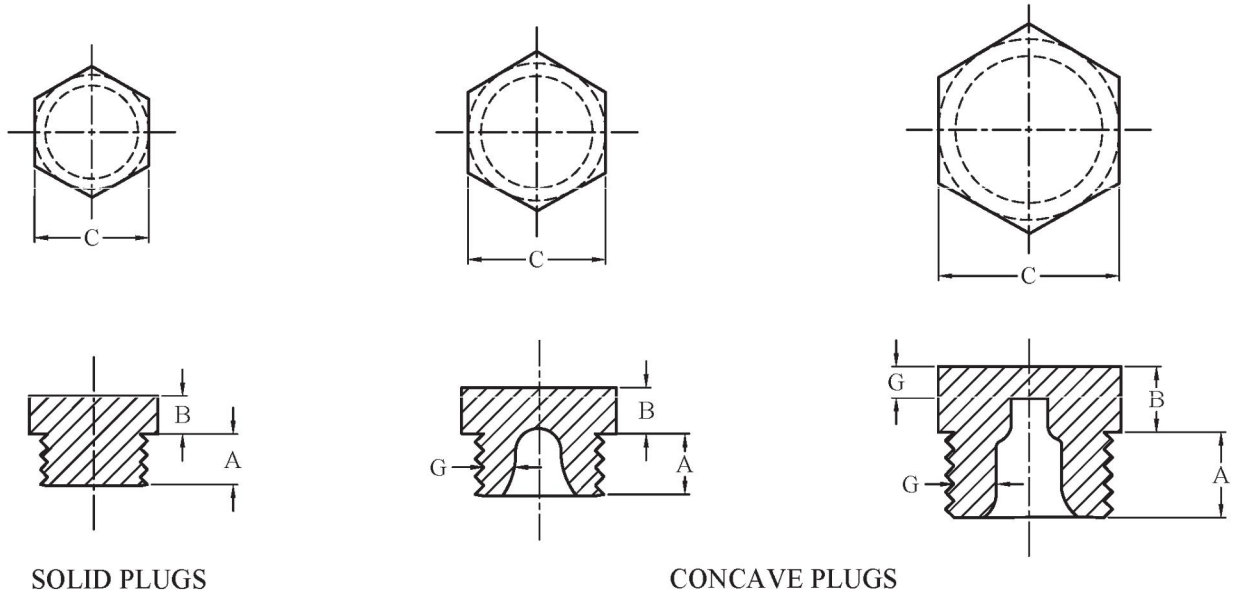


TABLE 23

Dimensions of Class 1000 Wrought Threaded Hex Head Plugs

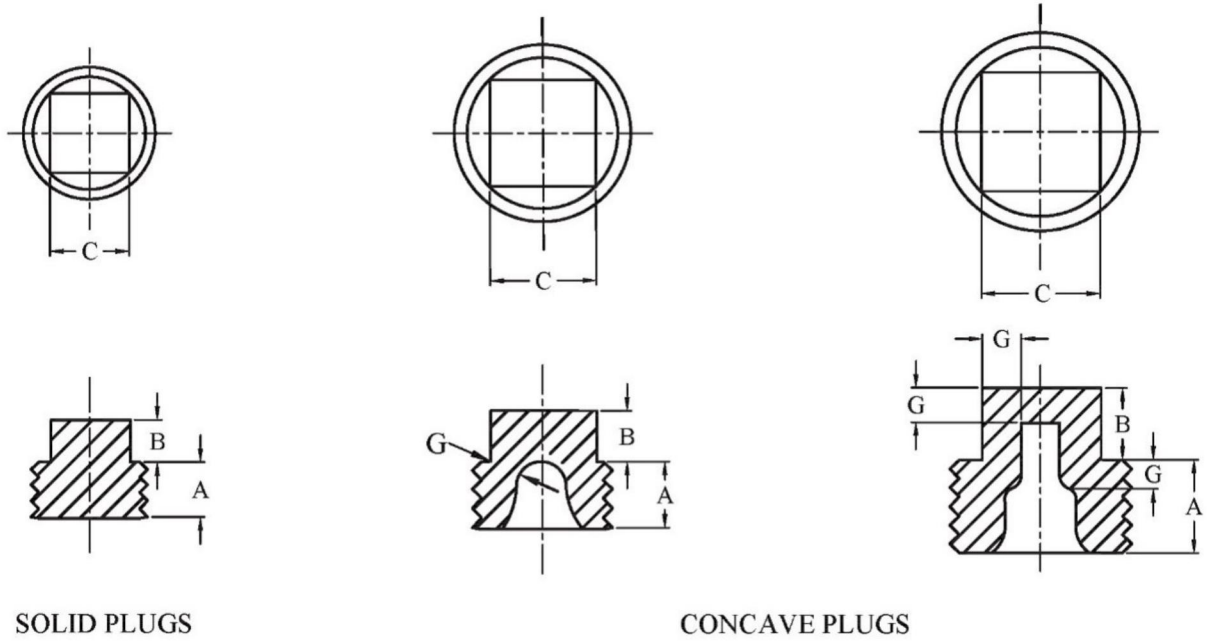
Dimensions in inches

NPS	Thread Length (Min.)	Height of Head (Min.)	Nominal Width Across Flats <sup>(b)</sup>	Metal Thickness <sup>(b)</sup>
	A	B	C	G
1/8	0.38	0.12	7/16 <sup>(a)</sup>	0.19
1/4	0.44	0.12	5/8	0.19
3/8	0.50	0.16	11/16 <sup>(a)</sup>	0.19
1/2	0.56	0.19	7/8	0.25
3/4	0.62	0.22	1 1/16 <sup>(a)</sup>	0.25
1	0.75	0.25	1 3/8	0.38
1 1/4	0.81	0.28	1 3/4	0.38
1 1/2	0.81	0.31	2	0.44
2	0.88	0.34	2 1/2	0.50
2 1/2	1.06	0.38	3	0.62
3	1.12	0.41	3 1/2	0.75
4	1.25	0.50	4 5/8	0.88

## NOTES:

- (a) When made from bar stock; the dimensions may be 1/2, 3/4, and 1 1/8 inches, respectively, in order to use regular bar stock sizes.
- (b) Manufacturers applied tolerance shall assure dimensions will fit U.S. customary tooling.

**Class 1000**



SOLID PLUGS

CONCAVE PLUGS

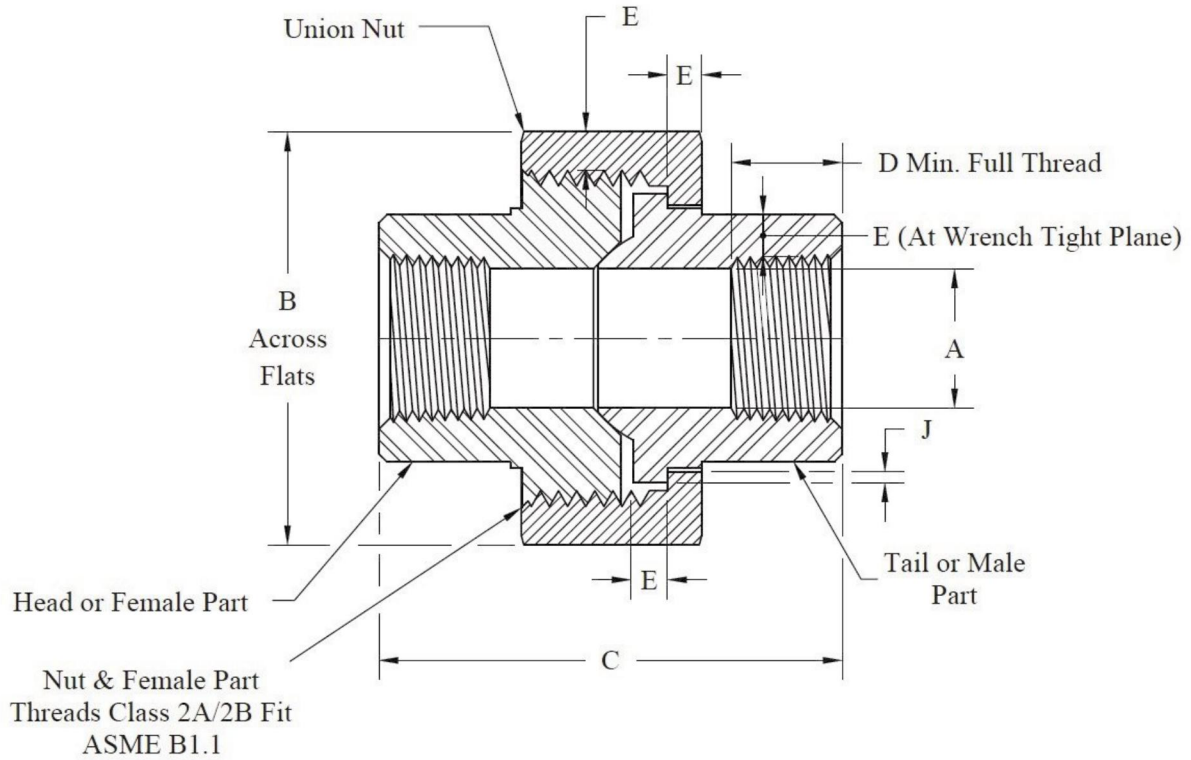
**TABLE 24**  
**Dimensions of Class 1000 Wrought Threaded Square Head Plugs**

Dimensions in inches

NPS	Thread Length (Min.)	Height of Head (Min.)	Nominal Width Across Flats <sup>(b)</sup>	Metal Thickness <sup>(a)</sup> (Min.)
	A	B	C	G
1/8	0.38	0.25	9/32	0.19
1/4	0.44	0.25	3/8	0.19
3/8	0.50	0.31	7/16	0.19
1/2	0.56	0.38	9/16	0.25
3/4	0.62	0.44	5/8	0.25
1	0.75	0.50	13/16	0.38
1¼	0.81	0.56	15/16	0.38
1½	0.81	0.62	1⅛	0.44
2	0.88	0.69	1⅝	0.50
2½	1.06	0.75	1½	0.62
3	1.12	0.81	1⅞	0.75
4	1.25	1.00	2½	0.88

**NOTE:** (a) Manufacturers applied tolerance shall assure dimensions will fit U.S. customary tooling.

**Class 1000**

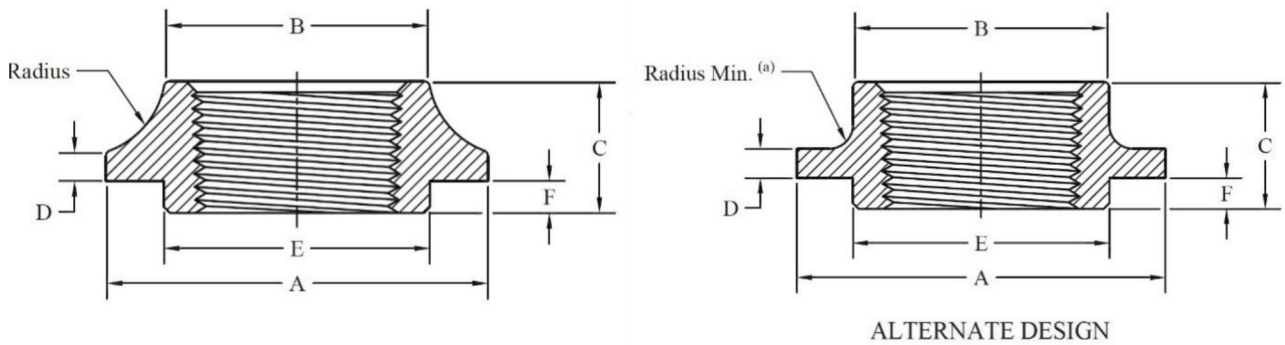


**TABLE 25**  
**Dimensions of Class 1000 Wrought Threaded Unions**

Dimensions in inches

NPS	Water Way Bore (Min.)	Across Flats (Min.)	Length Assembled (Min.)	Length of Internal Thread (Min.)	Nut & Body (Min.)	Bearing (Min.)
	A	B	C	D	E	J
1/8	0.21	0.93	1.26	0.30	0.09	0.037
1/4	0.36	1.10	1.44	0.32	0.09	0.037
3/8	0.52	1.26	1.50	0.36	0.10	0.047
1/2	0.61	1.45	1.72	0.43	0.10	0.047
3/4	0.80	1.71	1.94	0.50	0.12	0.069
1	1.00	2.07	2.00	0.58	0.13	0.069
1¼	1.31	2.50	2.26	0.67	0.14	0.104
1½	1.55	2.87	2.41	0.70	0.15	0.104
2	2.03	3.41	2.75	0.75	0.17	0.104
2½	2.38	4.12	3.22	0.92	0.21	0.107
3	3.00	4.75	3.50	0.98	0.23	0.107
4	4.03	6.00	3.85	1.08	0.26	0.107

## Class 1000



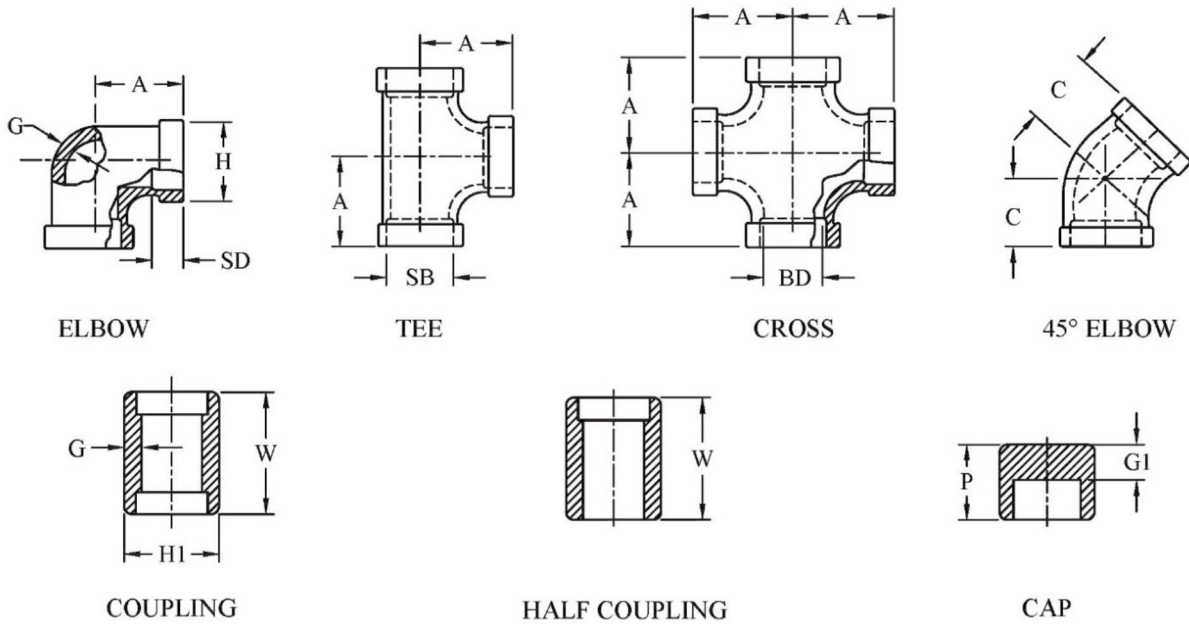
**TABLE 26**  
**Dimensions of Class 1000 Wrought Weld Spuds**

Dimensions in inches

NPS	Flange Diameter	Hub Diameter (Min.)	Overall Height	Flange Thickness (Min.)	Pilot Diameter ( $\pm 0.03$ )	Pilot Depth (Min.)
	A	B	C	D	E	F
1/8	1.38	0.88	0.47	0.09	0.84	0.08
1/4	1.50	1.00	0.50	0.14	0.97	0.12
3/8	1.62	1.06	0.50	0.14	0.94	0.12
1/2	1.81	1.12	0.63	0.16	1.16	0.16
3/4	2.06	1.44	0.75	0.16	1.34	0.16
1	2.38	1.75	0.83	0.20	1.70	0.19
1¼	2.50	2.13	0.88	0.20	1.94	0.19
1½	3.03	2.38	0.88	0.20	2.31	0.19
2	3.38	2.88	0.81	0.19	2.69	0.19
2½	4.06	3.31	1.00	0.22	3.19	0.19
3	4.62	3.94	1.00	0.22	3.69	0.19
4	5.81	4.94	1.25	0.22	4.75	0.19

**NOTE:** (a) Minimum radii of alternate design shown on right illustration is 0.125 inches.  
 Minimum radii of traditional design shown on the left is at the manufacturers option.

**Class 1000**

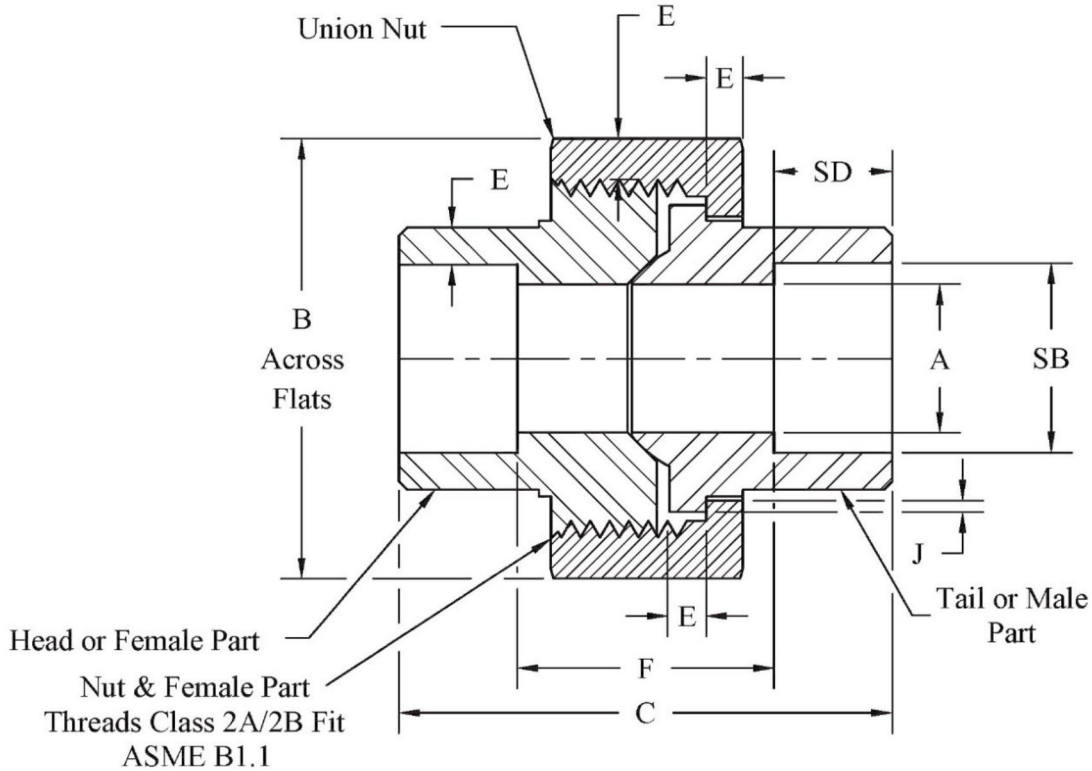


**TABLE 27**  
**Dimensions of Class 1000 Wrought Socket-Welding Fittings**

Dimensions in inches

NPS	Center-to-End Elbows, Tees, & Crosses	Center-to-End 45° Elbows	Outside Band Diameter (Min.)	Socket Bore (Min.) / (Max.)	Bore Diameter (Min.) / (Max.)	Socket Depth (Min.)	Metal Thickness (Min.)	Coupling & Cap Outside Diameter (Min.)	Coupling Length (Min.)	End Wall Thickness (Min.)
	A	C	H	SB	BD	SD	G	H1	W	G1
1/8	0.81	0.69	0.75	0.420 / 0.440	0.227 / 0.337	0.32	0.09	0.55	1.00	0.09
1/4	0.81	0.69	0.75	0.555 / 0.575	0.380 / 0.440	0.32	0.09	0.74	1.00	0.09
3/8	0.93	0.81	0.87	0.690 / 0.710	0.515 / 0.575	0.32	0.10	0.86	1.12	0.10
1/2	1.12	0.87	1.12	0.855 / 0.875	0.644 / 0.704	0.32	0.10	1.05	1.38	0.12
3/4	1.31	1.00	1.34	1.065 / 1.085	0.854 / 0.914	0.37	0.12	1.30	1.50	0.13
1	—	—	—	1.330 / 1.350	1.067 / 1.127	0.44	0.13	1.61	1.62	0.15
1¼	—	—	—	1.675 / 1.695	1.412 / 1.472	0.50	0.14	1.86	2.00	0.17
1½	—	—	—	1.915 / 1.935	1.652 / 1.712	0.50	0.15	2.17	2.12	0.19
2	—	—	—	2.406 / 2.426	2.127 / 2.187	0.56	0.17	2.74	2.50	0.22

**Class 1000**



**TABLE 28**  
**Dimensions of Class 1000 Wrought Socket-Welding Unions**

Dimensions in inches

NPS	Water Way Bore (Min.)	Across Flats (Min.)	Length Assembled (Min.)	Nut & Body (Min.)	Laying Length (Min.) / (Max.)	Bearing (Min.)	Socket Bore Diameter (Min.) / (Max.)	Depth of Socket (Min.)
	A	B	C	E	F	J	SB	SD
1/8	0.21	0.93	1.26	0.09	0.573 / 0.673	0.037	0.420 / 0.440	0.32
1/4	0.36	1.10	1.44	0.09	0.573 / 0.673	0.037	0.555 / 0.575	0.32
3/8	0.52	1.26	1.50	0.10	0.466 / 0.545	0.047	0.690 / 0.710	0.32
1/2	0.61	1.45	1.72	0.10	0.886 / 0.986	0.047	0.855 / 0.875	0.32
3/4	0.80	1.71	1.94	0.12	1.013 / 1.108	0.069	1.065 / 1.085	0.37
1	1.00	2.07	2.00	0.13	1.102 / 1.199	0.069	1.330 / 1.350	0.44
1¼	1.31	2.50	2.26	0.14	1.239 / 1.324	0.104	1.675 / 1.695	0.50
1½	1.55	2.82	2.41	0.15	1.458 / 1.544	0.104	1.915 / 1.935	0.50
2	2.03	3.41	2.75	0.17	1.335 / 1.421	0.104	2.406 / 2.426	0.56
2½	2.38	4.12	3.22	0.21	2.100 / 2.186	0.107	2.906 / 2.931	0.56
3	3.00	4.75	3.50	0.23	2.380 / 2.466	0.107	3.535 / 3.560	0.56
4	4.03	6.00	3.85	0.26	2.470 / 2.556	0.107	4.454 / 4.570	0.69



## ANNEX A

### Referenced Standards and Applicable Dates

This Annex is an integral part of this Standard Practice and is placed after the main text for convenience.

<b>Standard Name</b>	<b>Description</b>
<b><u>ASME; ANSI/ASME</u></b>	
B1.1-2003 (R2018)	Unified Inch Screw Threads (UN and UNR Thread Form)
B1.20.1-2013	Pipe Threads, General Purpose (Inch)
B36.19M-2018	Stainless Steel Pipe
<b><u>ASTM</u></b>	
	<b>Standard Specification for:</b>
A182/A182M-18a	Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
A262-15	Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
A351/A351M-18	Castings, Austenitic, for Pressure Containing Parts
A479/A479M-18	Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
A511/A511M-16	Seamless Stainless Steel Mechanical Tubing and Hollow Bar
<b><u>ISO</u></b>	
3651-2:1998	Determination of Resistance to Intergranular Corrosion of Stainless Steels – Part 2: Ferritic, Austenitic and Ferritic-Austenitic (duplex) Stainless Steels – Corrosion Test in Media Containing Sulfuric Acid
<b><u>MSS; ANSI/MSS</u></b>	
SP-25-2018	Standard Marking System for Valves, Fittings, Flanges, and Unions

The following organizations appear in the above list:

ANSI	American National Standards Institute 25 West 43rd Street, Fourth Floor New York, NY 10036-7406
ASME	American Society of Mechanical Engineers (ASME International) Two Park Avenue New York, NY 10016-5990
ASTM	ASTM International 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken, PA 19428-2959
ISO	International Organization for Standardization 1, ch. de la Voie-Creuse, Case Postale 56 CH-1211 Geneva 20, Switzerland
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 127 Park Street, NE Vienna, VA 22180-4602

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**MSS Standard Practices (SPs) related to or referenced in this publication:**

ANSI/MSS SP-25      *Standard Marking System for Valves, Fittings, Flanges, and Unions*

**American National Standards Published by MSS, an ANSI-accredited Standards Developer:**

ANSI/MSS SP-25      *Standard Marking System for Valves, Fittings, Flanges, and Unions*  
ANSI/MSS SP-44      *Steel Pipeline Flanges*  
ANSI/MSS SP-55      *Quality Standard for Steel Castings for Valves, Flanges, Fittings, and Other Piping Components  
– Visual Method for Evaluation of Surface Irregularities*  
ANSI/MSS SP-58      *Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and  
Installation*  
ANSI/MSS SP-96      *Terminology for Valves, Fittings, and Their Related Components*  
ANSI/MSS SP-114      *Corrosion Resistant Pipe Fittings Threaded and Socket Welding Class 150 and 1000*  
ANSI/MSS SP-122      *Plastic Industrial Ball Valves*  
ANSI/MSS SP-134      *Valves for Cryogenic Service, including Requirements for Body/Bonnet Extensions*  
ANSI/MSS SP-135      *High Pressure Knife Gate Valves*  
ANSI/MSS SP-138      *Quality Standard Practice for Oxygen Cleaning of Valves and Fittings*  
ANSI/MSS SP-144      *Pressure Seal Bonnet Valves*

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