MSS SP-83-2018

Class 3000 and 6000 Pipe Unions, Socket Welding and Threaded

(Carbon Steel, Alloy Steel, Stainless Steels, and Nickel Alloys)

Standard Practice
Developed and Approved by the
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The U.S. customary units in this Standard Practice are regarded as the standard. Combining or converting values between systems may result in non-conformance with this Standard Practice.

> Substantive changes in this 2018 edition are "flagged" by parallel bars as shown on the margins of this paragraph. The specific detail of the change may be determined by comparing the material flagged with that in the previous edition.

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

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FOREWORD

This Standard Practice was originally approved in 1976; providing a clear industry standard for Class 3000 Carbon Steel Unions that were primarily for use in high-pressure industrial, oil-field, and petrochemical industries. Metric units were included and derived utilizing standard conversion factors and rounded to appropriate accuracy.

In 1987, austenitic stainless-steel Grades 304/304L and 316/316L were added for use in process chemical, pharmaceutical, power generation, and other industries where corrosion resistance was a major concern.

In 1995, socket-welding union dimensions for socket diameters, socket wall thicknesses, and union "water-way" bores were aligned to correspond with dimensions of the ASME B16.11, for Class 3000 fittings. Metric equivalencies were removed as reference units.

In the 2001 edition, the waterways of threaded unions were adapted to allow the use of the larger diameter drills used for National Pipe Thread (NPT) type threading, which was in line with practices for threaded fitting use within the same piping systems.

In 2006, the Standard Practice was essentially reaffirmed with minor editorial changes.

The 2014 revision represented a substantive revision for SP-83. The committee reviewed and confirmed the basis for the original pressure-temperature ratings contained in the Standard Practice and pressure-temperature tables were updated as a result. Based on formula, test, and field experience, coverage for numerous alloy steel, stainless steel and nickel alloy grades were added to the Standard Practice. In addition, on the same basis, dimensions, materials, and pressure-temperature ratings were added for the new inclusion of Class 6000 socket-welding and threaded unions. The revisions contained in the 2014 edition provided for a more robust and comprehensive standard for pipe unions, intended for commercial and industrial applications of a wide variety.

This 2018 revision updated (1) the materials in Tables 4 and 5 to include A350 LF2, A420-WPL6, and B462-N08020, (2) the size and service designation/pressure marking requirements on union nuts, and (3) the references in Annex A, among other editorial and formatting adjustments. Note the re-inclusion of SI (metric) units, as an independent but equal standard to the existing U.S. customary units, is envisioned for the next edition.

GENERAL CAUTIONARY NOTE:

Union parts from different manufacturers are not functionally interchangeable and combining parts from different manufacturers is not recommended.

CAUTIONARY NOTES REGARDING INSTALLATION OF PIPE UNIONS:

a) Leakage from a union can result when joining pipe ends which are poorly aligned.

b) Care should be taken to avoid placing unions in lines subject to live loads and bending loads, which may cause leakage.

c) Care should be taken to prevent damage to the seating surfaces.

d) Due consideration should be given to the possibility of shock pressures in the system.

e) Installation techniques or instructions are outside the scope of this Standard Practice.

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Manufacturers Standardization Society of the Valve and Fittings Industry

TABLE OF CONTENTS

SECTION

TABLE

FIGURE

ANNEX

CLASS 3000 AND 6000 PIPE UNIONS, SOCKET WELDING AND THREADED (CARBON STEEL, ALLOY STEEL, STAINLESS STEELS, AND NICKEL ALLOYS)

1. SCOPE

1.1 This Standard Practice contains envelope and other essential dimensions, finish, tolerances, testing, marking, material, and minimum performance requirements for forged carbon steel, alloy steel, stainless steel, and nickel alloy pipe unions, socket welding and threaded ends.

2. PRESSURE RATINGS

2.1 These unions shall be designated as Class 3000 or Class 6000, socket welding or threaded and shall carry ratings shown in Table 4 for Class 3000 or Table 5 for Class 6000.

2.2 Class designations of these unions are correlated with ASME B36.10 Pipe Schedule Thicknesses as shown in Table 1.

TABLE 1
Correlation of Class Designation with Pipe Schedule

Class Designation of Union	Pipe Used in Wall Thickness Calculations [a]
3000	Schedule 80
6000	Schedule 160

NOTE: (a) This table is not intended to restrict the use of pipe of thinner or thicker wall with unions. The pipe actually used may be thinner or thicker in nominal wall than that shown in this table. The rating of the pipe, or the rating of the union as shown in Tables 4 or 5, whichever is less, may govern the rating of the system.

2.3 Since ASME B36.10 does not include Schedule 160 thickness for NPS 1/8, 1/4 and 3/8, the values in Table 2 shall be used as the nominal wall thicknesses of the pipe.

TABLE 2
Nominal Wall Thickness of Schedule 160 Pipe

NPS of Union	Schedule 160 Nominal Wall
1/8	0.124
1/4	0.145
3/8	0.158

3. SIZE

3.1 The size of the union is identified by the nominal pipe size (NPS).

4. DESCRIPTION

4.1 The complete union shall consist of three parts: male end, female end, and nut. Equivalent terms are tabulated in Table 3.

TABLE 3
Terminology of Parts

Preferred Term	Equivalent Terms
Male	Male seat-end Tail Piece – Nut Piece – Coupling – Ball End
Female	Female seat-end Thread Piece – Body – Head – Cone End
Nut	Union Coupling Nut – Swivel – Ring

4.2 The seating surfaces of the joint shall be integral metal-to-metal, ball-to-cone design. Male and Female ends shall be machined with sockets for socket welding or threaded with internal National Pipe Thread (NPT) type pipe threads in accordance with ASME B1.20.1. Male and Female ends and Nuts may be round, polygon, or modified polygon with rounded corners, at the option of the manufacturer. The length of the union ends shall be sufficient to provide a suitable wrenching surface.

5. MARKING

5.1 Each union part shall be permanently marked in accordance with MSS SP-25. The marking shall include (but is not limited to) the following:

a) Manufacturer's name or trademark.

b) Material grade identification – in accordance with the requirements of the applicable ASTM specifications listed in Tables 4 or 5.

NOTE: Multiple material markings shall be allowed as covered in ASTM material specifications listed in Tables 4 or 5.

c) Material lot or heat number for traceability.

d) Service designation: 3000 or 3M or 6000 or 6M (M to designate units of 1000). See Section 5.4.

e) The nominal pipe size. See Section 5.4.

5.2 All three parts of a union, in compliance with all requirements of this SP, shall be marked "SP83".

5.3 Unions manufactured from materials meeting all the ASTM material specification requirements for more than one specification, class or grade, may, at the manufacturer's option, be marked with more than one specification, class or grade designation, such as F304/304L and F316/316L, or A105/A234 WPB.

5.4 Union nut marking of Service Designation, Section 5.1 (d), and Nominal Pipe Size, Section 5.1 (e), are at the option of the manufacturer.

6. MATERIAL

6.1 Unions shall conform to the requirements of the material specifications, grades and classes listed in Tables 4 and 5.

6.2 The three parts of a union assembly (assy.) shall be manufactured from materials which have the same requirements for chemical composition, mechanical properties, and applicable heat treatment.

6.3 Union parts may be forged, seamlessly formed, or made from wrought bars conforming to the requirements for the grades and classes of the ASTM material specifications listed in Tables 4 and 5.

6.4 Unions may be made from other wrought seamless materials, by agreement between the manufacturer and the purchaser, but shall not be marked "SP83".

7. TESTS

7.1 Pressure testing is not required by this Standard Practice.

8. DESIGN AND DIMENSIONS

8.1 ***Socket Wall Thickness for Socket Welding Unions*** The socket wall thickness shall be no less than the corresponding values, C, shown in Tables 7 and 8.

8.2 ***Minimum Body Wall Thickness for Socket Welding Unions*** The minimum body wall thickness, other than socket wall, must be equal to or greater than the nominal wall thickness of Schedule 80 pipe for Class 3000 or Schedule 160 pipe for Class 6000 of the same size as the union, as established by ASME B36.10M.

8.3 ***Minimum Wall Thickness for Threaded Unions*** (See Dimension C in Table 9 for Class 3000 and Table 10 for Class 6000). The minimum wall thickness at the root of the pipe thread at the wrench tight plane must equal or exceed the nominal wall thickness for Schedule 80 pipe for Class 3000 or Schedule 160 pipe for Class 6000.

8.4 ***Other Dimensions*** The dimensions for unions capable of meeting this Standard Practice are shown in Tables 7 and 8 for socket welding unions and Tables 9 and 10 for threaded unions.

8.5 Union parts from different manufacturers are not functionally interchangeable and combining parts from different manufacturers is not recommended.

9. SOCKET WELDING UNIONS

9.1 To provide assembled union uniformity, this Standard Practice includes laying length dimensions (Tables 7 and 8, Column E) for the location of the bottom of the sockets. Socket welding union ends shall be faced at right angles to the axis to provide a flat surface against which to weld and the socket shall be counter-bored or otherwise machined to insure uniform depth and circularity.

9.2 When installing socket weld end unions, to minimize the possibility of cracking of the fillet welds, it is recommended that the connecting pipe be withdrawn approximately 0.06 inches away from the bottom of the union socket bore before welding (see Figure 1).

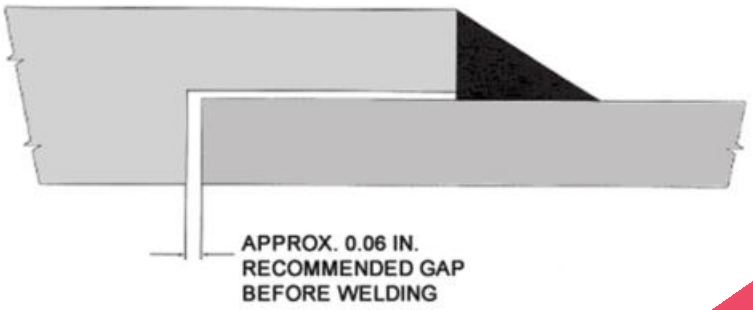

Figure 1 – Welding Gap

10. THREADED UNIONS

10.1 Dimensions for threaded unions are shown in Tables 9 and 10. Internal NPT type pipe threads shall be in accordance with ASME B1.20.1. Gaging procedures and practice shall be in accordance with Section 3.1 of ASME B1.20.1.

11. NUT THREADS

11.1 Internal threads of the nut and external threads of the Female part (Thread Piece) 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.

11.2 At manufacturer's option, changes to the values in Column "H" of Tables 7 through 10 are permitted, provided the requirements of ASME B1.1 and all requirements of this Standard Practice are met.

12. FINISH

12.1 Surfaces must be free of sharp burrs and have a workmanlike finish.

13. TOLERANCES

13.1 ***General*** Tolerances are listed in Tables 7, 8, 9, and 10.

13.2 ***Concentricity*** The socket shall be concentric with the waterway bore within a tolerance of plus or minus 0.03 (±0.03) inches for all sizes.

13.3 ***Coincidence of Axis*** The maximum allowable variation in the alignment of one threaded pipe end of the assembled union to the axis of the opposite threaded pipe end shall not exceed 0.19 inches in 1 foot. Figure 2 illustrates one method that may be used to check alignment. Recommended minimum nut tightening torque values for checking coincidence of axis are listed in Table 6.

14. CORROSION PROTECTION

14.1 Carbon and alloy steel unions shall be effectively protected against corrosion. Excess forming, machining or processing oils shall be considered unacceptable as corrosion protective media. Specialty protection shall be a matter of agreement between the manufacturer and purchaser.

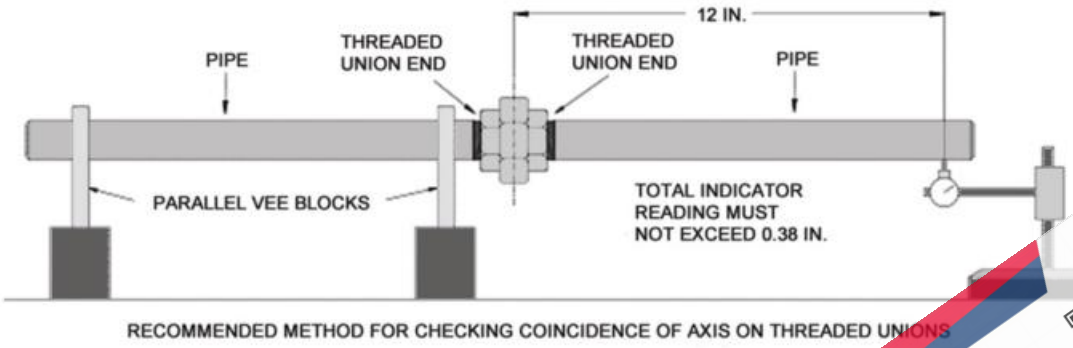

FIGURE 2
Recommended Method for Checking Coincidence of Axis on Threaded Unions
(For Illustration Only)

| TABLE 4 |
Pressure-Temperature Service Rating,
Class 3000 Pipe Unions – Socket Welding and Threaded Ends

Service Temperature (° F)	Non-Shock Working Pressure (psig)													
	A105 A234 WPC[S]	A350 LF2 A420 WPL6 [S]	A182 F1 A234 WP1[S]	A182 F5 A234 WP5[S]	A182 F5A	A182 F9	A182 F11 CL2 A234 WP11[S] CL2	A182 F22 CL3 A234 WP22[S] CL3	A182 F304 A403 WP304[S]	A182 F304L A403 WP304L[S]	A182 F304H A403 WP304H[S]	A182 F316 A403 WP316[S]	A182 F316L A404 WP316L[S]	A182 F316H A403 WP316H[S]
100	3000	3000	2820	3000	3000	3000	2960	3000	2915	2430	2915	2915	2430	2915
200	2750	2750	2820	2980	3000	3000	2960	3000	2430	2070	2430	2510	2070	2510
300	2650	2650	2780	2830	2950	2950	2875	2950	2180	1850	2180	2265	1850	2265
400	2565	2565	2680	2710	2860	2860	2760	2860	2010	1700	2010	2080	1700	2080
500	2445	2445	2600	2615	2695	2695	2660	2695	1885	1595	1885	1935	1595	1935
600	2300	2300	2450	2450	2450	2450	2450	2450	1790	1505	1790	1830	1505	1830
650	2225	2225	2380	2380	2380	2380	2380	2380	1750	1480	1750	1790	1480	1790
700	2150	2150	2300	2300	2300	2300	2300	2300	1710	1460	1710	1760	1460	1760
750	2055	2055	2155	2155	2155	2155	2155	2155	1675	1430	1675	1730	1430	1730
800	–	–	2060	2060	2060	2060	2060	2060	1645	1400	1645	1710	1400	1710
850	–	–	1970	1970	1970	1970	1970	1970	1605	1370	1605	1695	1370	1695
900	–	–	–	1515	1515	1820	1820	1820	1575	–	1575	1680	–	1680
950	–	–	–	1110	1110	1525	1240	1565	1545	–	1545	1565	–	1565
1000	–	–	–	805	805	1030	800	1080	1435	–	1435	1475	–	1475

Service Temperature (° F)	Non-Shock Working Pressure (psig)													
	A182 F317 A403 WP317[S]	A182 F321 A403 WP321[S]	A182 F321H A403 WP321H[S]	A182 F317L A403 WP317L[S]	A182 F347 A403 WP347[S]	A182 F347H A403 WP347H[S]	A182 F44 A403 WPS31254[S]	A182 F51	A182 F53	A182 F55	A182 F91 A234 WP91[S]	B564 UNS N04400 B366 WPNICU[S]	B564 UNS N10276 B366 WPHC276[S]	B462 UNS N08020
100	2915	2915	2915	2430	2915	2915	3000	3000	3000	3000	3000	2430	3000	3000
200	2510	2625	2625	2070	2680	2680	3000	3000	3000	3000	3000	2130	3000	3000
300	2265	2410	2410	1850	2500	2500	2700	2700	2700	2700	2950	1985	2950	2875
400	2080	2235	2235	1700	2335	2335	2490	2490	2490	2490	2860	1915	2825	2765
500	1935	2090	2090	1595	2195	2195	2350	2350	2350	2350	2695	1915	2695	2655
600	1830	1970	1970	1505	2090	2090	2255	–	–	–	2450	1915	2450	2450
650	1790	1925	1925	1480	2050	2050	2215	–	–	–	2380	1[illegible]	2380	2380
700	1760	1885	1885	1460	2010	2010	2195	–	–	–	2300	1905	2300	2300
750	1730	1855	1855	1430	1990	1990	2155	–	–	–	2[illegible]	1[illegible]	[illegible]55	2155
800	1710	1830	1830	1400	1970	1970	1970	–	–	–	2[illegible]	1855	2[illegible]60	2055
850	1695	1805	1805	1370	1965	1965	1965	–	–	–	1970	1525	1970	–
900	1680	1790	1790	–	1820	1820	1820	–	–	–	1820	1110	1820	–
950	1565	1565	1565	–	1565	1565	1565	–	–	–	1565	–	1565	–
1000	1475	1475	1475	–	1475	1475	1475	–	–	–	1475	–	–	–

| TABLE 5 |
Pressure-Temperature Service Rating,
Class 6000 Pipe Unions – Socket Welding and Threaded Ends

Service Temperature (° F)	Non-Shock Working Pressure (psig)													
	A105 A234 WPC[S]	A350 LF2 A420 WPL6 [S]	A182 F1 A234 WP1[S]	A182 F5 A234 WP5[S]	A182 F5A	A182 F9	A182 F11 CL2 A234 WP11[S] CL2	A182 F22 CL3 A234 WP22[S] CL3	A182 F304 A403 WP304[S]	A182 F304L A403 WP304L[S]	A182 F304H A403 WP304H[S]	A182 F316 A403 WP316[S]	A182 F316L A404 WP316L[S]	A182 F316H A403 WP316H[S]
100	6000	6000	5645	6000	6000	6000	6000	6000	5835	4860	5835	5835	4860	5835
200	5500	5500	5645	5965	6000	6000	6000	6000	4860	4140	4860	5020	4140	5020
300	5300	5300	5565	5670	5900	5900	5850	5900	4355	3695	4355	4530	3695	4530
400	5135	5135	5370	5415	5720	5720	5615	5720	4025	3405	4025	4160	3405	4160
500	4885	4885	5200	5235	5385	5385	5385	5385	3775	3190	3775	3870	3190	3870
600	4600	4600	4900	4900	4900	4900	4900	4900	3580	3015	3580	3655	3015	3655
650	4450	4450	4770	4770	4770	4770	4770	4770	3500	2955	3500	3580	2955	3580
700	4305	4305	4600	4600	4600	4600	4600	4600	3425	2915	3425	3520	2915	3520
750	4115	4115	4310	4310	4310	4310	4310	4310	3345	2860	3345	3460	2860	3460
800	–	–	–	4115	4115	4115	4115	4115	3285	–	3285	3425	2800	3425
850	–	–	–	3950	3950	3950	3950	3950	3210	–	3210	3385	2740	3385
900	–	–	–	3030	3030	3640	3640	3640	3150	–	3150	3365	–	3365
950	–	–	–	2220	2220	3060	2580	3130	3090	–	3090	3130	–	3130
1000	–	–	–	1610	1610	2055	1750	2170	2870	–	2870	2945	–	2945

Service Temperature (° F)	Non-Shock Working Pressure (psig)													
	A182 F317 A403 WP317[S]	A182 F321 A403 WP321[S]	A182 F321H A403 WP321H[S]	A182 F317L A403 WP317L[S]	A182 F347 A403 WP347[S]	A182 F347H A403 WP347H[S]	A182 F44 A403 WPS31254[S]	A182 F51	A182 F53	A182 F55	A182 F91 A234 WP91[S]	B564 UNS N04400 B366 WPNICU[S]	B564 UNS N10276 B366 WPHC276[S]	B462 UNS N08020
100	5835	5835	5835	4860	5835	5835	6000	6000	6000	6000	6000	4860	6000	6000
200	5020	5250	5250	4140	5370	5370	6000	6000	6000	6000	6000	4260	6000	6000
300	4530	4825	4825	3695	5000	5000	5405	5405	5405	5405	5900	3970	5900	5760
400	4160	4475	4475	3405	4670	4670	4980	4980	4980	4980	5720	3830	5660	5520
500	3870	4180	4180	3190	4395	4395	4705	4705	4705	4705	5385	3830	5385	5310
600	3655	3950	3950	3015	4180	4180	4510	–	–	–	4900	3830	4900	4900
650	3580	3850	3850	2955	4105	4105	4435	–	–	–	4770	3830	[illegible]	4775
700	3520	3775	3775	2915	4025	4025	4395	–	–	–	4600	[illegible]	[illegible]	4595
750	3460	3715	3715	2860	3985	3985	4310	–	–	–	4310	[illegible]	[illegible]	4300
800	3425	3655	3655	2800	3950	3950	3950	–	–	–	4115	[illegible]	[illegible]	4110
850	3385	3615	3615	2740	3930	3930	3930	–	–	–	[illegible]	[illegible]	[illegible]	[illegible]
900	3365	3580	3580	–	3640	3640	3640	–	–	–	[illegible]	[illegible]	[illegible]	[illegible]
950	3130	3130	3130	–	3130	3130	3130	–	–	–	[illegible]	[illegible]	[illegible]	–
1000	2945	2945	2945	–	2945	2945	2945	–	–	–	[illegible]	2945	[illegible]	–

TABLE 6
Minimum Recommended Nut Tightening Torque for Checking Coincidence of Axis

NPS	Foot-Pounds (ft-lbs)[a] (minimum)
1/8	85
1/4	85
3/8	100
1/2	100
3/4	120
1	120
$1^1/_4$	130
$1^1/_2$	130
2	130
$2^1/_2$	150
3	150

INFORMATIONAL NOTE: (a) When describing torque, foot-pounds (ft-lbs) can also be expressed as foot-pound (ft-lb) and pound-force-foot (lbf-ft or shortened to lb-ft).

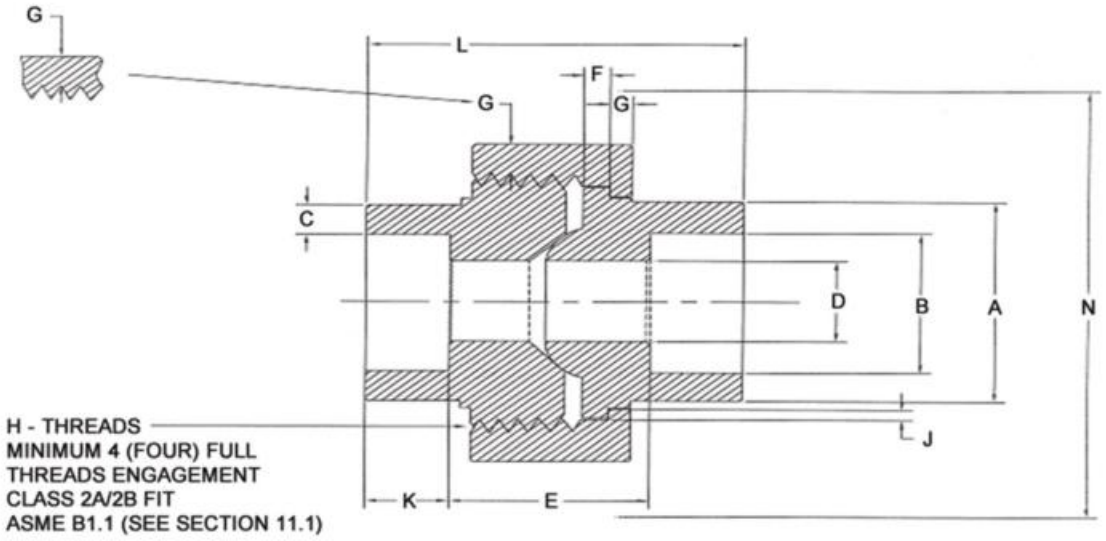

TABLE 7
Class 3000 Pipe Unions – Socket Welding Ends

Dimensions in inches

NPS	Pipe End (min.)	Socket Bore Dia.	Socket Wall (min.)	Water Way Bore[(a)]	Laying Length	Male Flange (min.)	Nut (min.)	Threads per Inch	Bearing (min.)	Depth of Socket (min.)	Length of Assy. (nominal)	Clear Assy. Nut
	A	B	C	D	E	F	G	H	J	K	L	N
1/8	0.86	0.440 0.420	0.125	0.299 0.239	0.88 0.75	0.125	0.125	16	0.049	0.38	1.63	2.0
1/4	0.86	0.575 0.555	0.130	0.394 0.334	0.88 0.75	0.125	0.125	16	0.049	0.38	1.63	2.0
3/8	1.02	0.710 0.690	0.138	0.523 0.463	1.06 0.81	0.135	0.135	14	0.054	0.38	1.81	2.2
1/2	1.23	0.875 0.855	0.161	0.652 0.592	1.06 0.81	0.145	0.145	14	0.059	0.38	1.93	2.3
3/4	1.46	1.085 1.065	0.168	0.854 0.794	1.25 1.00	0.160	0.160	11	0.066	0.50	2.24	2.6
1	1.79	1.350 1.330	0.196	1.079 1.019	1.35 1.03	0.180	0.175	11	0.073	0.50	2.44	3.1
1 1/4	2.16	1.695 1.675	0.208	1.410 1.350	1.60 1.28	0.210	0.205	10	0.084	0.50	2.80	3.7
1 1/2	2.42	1.935 1.915	0.218	1.640 1.580	1.66 1.34	0.230	0.220	10	0.091	0.50	3.01	4.4
2	2.96	2.426 2.406	0.238	2.097 2.037	1.79 1.47	0.260	0.250	10	0.106	0.62	3.39	5.2
2 1/2	3.61	2.931 2.906	0.302	2.529 2.409	2.43 2.05	0.295	0.280	8	0.121	0.62	4.05	5.9
3	4.30	3.560 3.535	0.327	3.128 3.008	2.51 2.11	0.325	0.315	8	0.139	0.62	4.29	6.9

NOTE: (a) The contact diameter of the male/female end is affected by the waterway bore (Col. D). The manufactu… consider the relationships between the contact point and waterway diameter in his design.

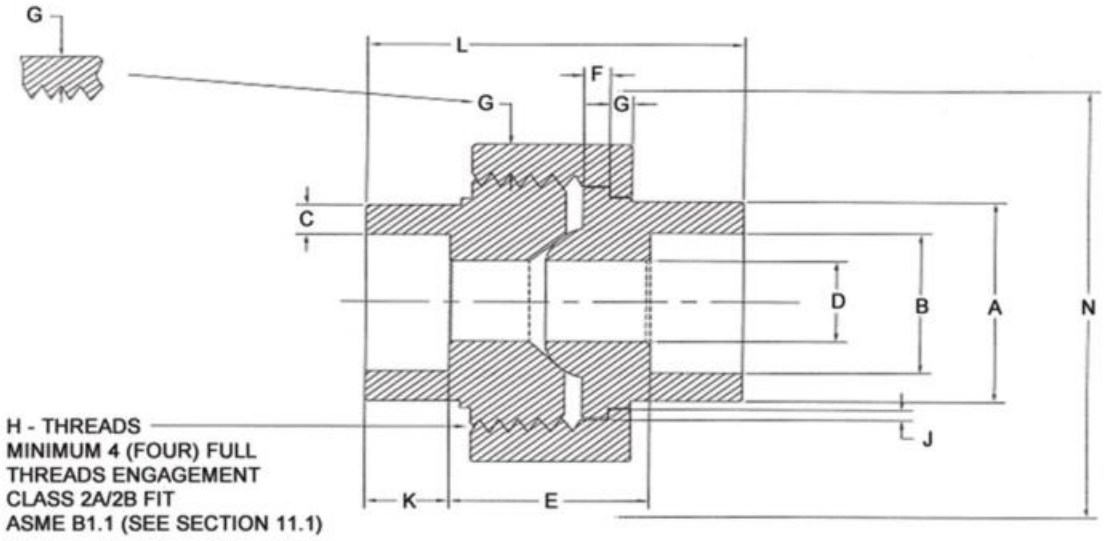

TABLE 8
Class 6000 Pipe Unions – Socket Welding Ends

Dimensions in inches

NPS	Pipe End (min.)	Socket Bore Dia.	Socket Wall (min.)	Water Way Bore[a]	Laying Length	Male Flange (min.)	Nut (min.)	Threads per Inch	Bearing (min.)	Depth of Socket (min.)	Length of Assy. (nominal)	Clear Assy. Nut
	A	B	C	D	E	F	G	H	J	K	L	N
1/8	0.86	0.440 0.420	0.135	0.189 0.126	0.88 0.75	0.125	0.125	16	0.049	0.38	1.63	2.0
1/4	1.02	0.575 0.555	0.158	0.280 0.220	1.06 0.81	0.135	0.135	14	0.054	0.38	1.81	2.2
3/8	1.23	0.710 0.690	0.172	0.389 0.329	1.06 0.81	0.145	0.145	14	0.059	0.38	1.93	2.3
1/2	1.46	0.875 0.855	0.204	0.494 0.434	1.25 1.00	0.160	0.160	11	0.066	0.38	2.24	2.6
3/4	1.79	1.085 1.065	0.238	0.642 0.582	1.35 1.03	0.180	0.175	11	0.073	0.50	2.44	3.1
1	2.16	1.350 1.330	0.273	0.845 0.785	1.60 1.28	0.210	0.205	10	0.084	0.50	2.80	3.7
1 1/4	2.42	1.695 1.675	0.273	1.190 1.130	1.66 1.34	0.230	0.220	10	0.091	0.50	3.01	4.4
1 1/2	2.96	1.935 1.915	0.307	1.368 1.308	1.79 1.47	0.260	0.250	10	0.106	0.50	3.39	5.2
2	3.61	2.426 2.406	0.374	1.717 1.657	2.43 2.05	0.295	0.280	8	0.121	0.62	4.03	5.9
2 1/2	4.30	2.931 2.906	0.409	2.155 2.095	2.51 2.11	0.325	0.315	8	0.139	0.62	4.25	6.9

NOTE: (a) The contact diameter of the male/female end is affected by the waterway bore (Col. D). The manufacturer shall consider the relationships between the contact point and waterway diameter in his design.

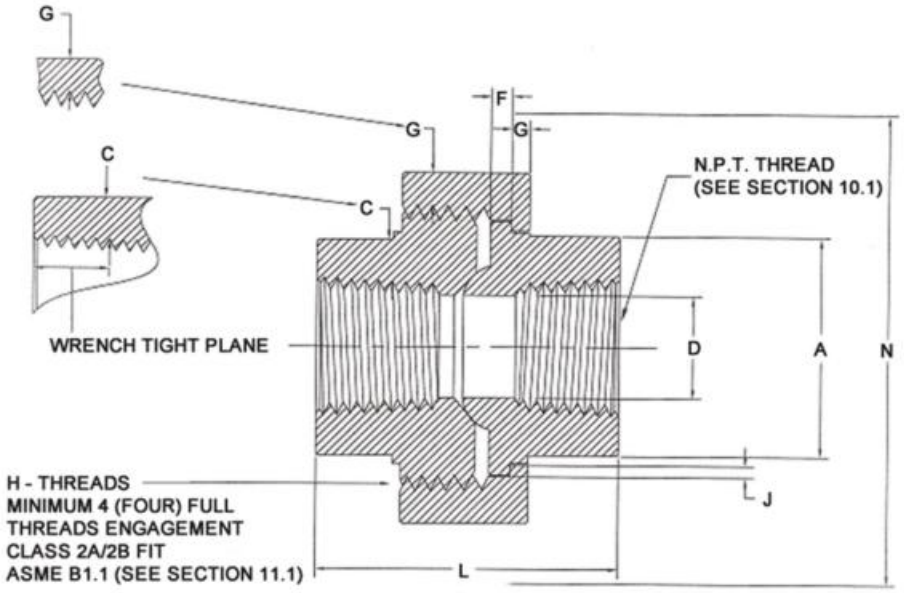

TABLE 9
Class 3000 Pipe Unions – Threaded Ends

Dimensions in inches

NPS	Pipe End (min.)	Wall (min.)	Water Way Bore [a]	Male Flange (min.)	Nut (min.)	Threads per Inch	Bearing (min.)	Length of Assy. (nominal)	Clear Assy. Nut
	A	C	D	F	G	H	J	L	N
1/8	0.58	0.095	0.332 0.253	0.125	0.125	16	0.049	1.63	2.0
1/4	0.75	0.119	0.438 0.372	0.125	0.125	16	0.049	1.63	2.0
3/8	0.90	0.126	0.562 0.532	0.135	0.135	14	0.054	1.81	2.2
1/2	1.09	0.147	0.703 0.672	0.145	0.145	14	0.059	1.93	2.3
3/4	1.32	0.154	0.906 0.842	0.160	0.160	11	0.066	2.24	2.6
1	1.63	0.179	1.141 1.092	0.180	0.175	11	0.073	2.44	3.1
1 1/4	1.99	0.191	1.484 1.392	0.210	0.205	10	0.084	2.80	3.7
1 1/2	2.25	0.200	1.714 1.622	0.230	0.220	10	0.091	3.01	4
2	2.76	0.218	2.188 2.052	0.260	0.250	10	0.106	3.39	5
2 1/2	3.36	0.276	2.609 2.532	0.295	0.280	8	0.121	4.03	6
3	4.03	0.300	3.250 3.042	0.325	0.315	8	0.139	4.29	7

NOTE: (a) The contact diameter of the male/female end is affected by the waterway bore (Col. D). The manufacturer shall consider the relationships between the contact point and waterway diameter in his design.

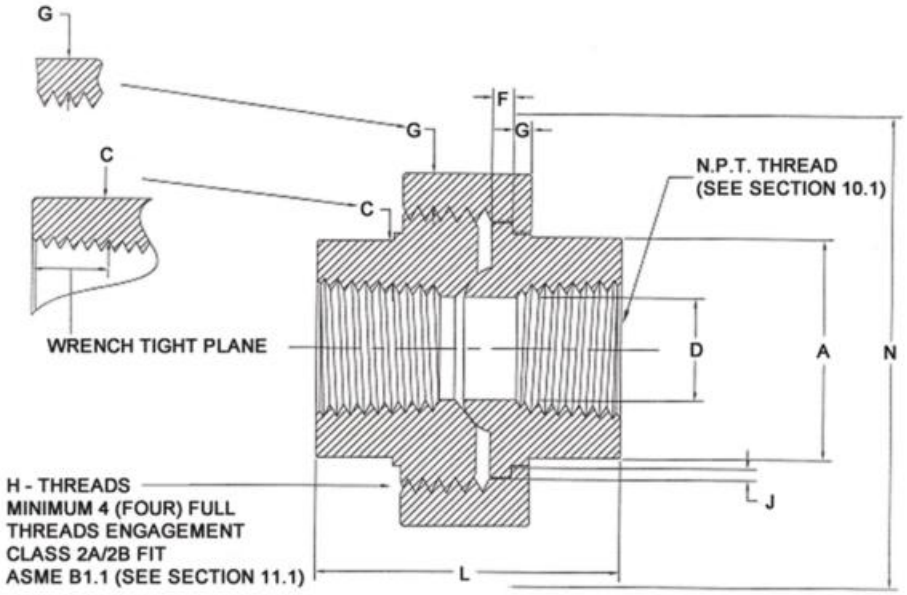

TABLE 10
Class 6000 Pipe Unions – Threaded Ends

Dimensions in inches

NPS	Pipe End (min.)	Wall (min.)	Water Way Bore [a]	Male Flange (min.)	Nut (min.)	Threads per Inch	Bearing (min.)	Length of Assy. (nominal)	Clear Assy. Nut
	A	C	D	F	G	H	J	L	N
1/8	0.65	0.124	0.332 0.126	0.125	0.125	16	0.049	1.63	2.0
1/4	0.83	0.145	0.438 0.220	0.135	0.135	14	0.054	1.81	2.2
3/8	0.99	0.158	0.562 0.329	0.145	0.145	14	0.059	1.93	2.3
1/2	1.22	0.188	0.703 0.434	0.160	0.160	11	0.066	2.24	2.6
3/4	1.49	0.219	0.906 0.582	0.180	0.175	11	0.073	2.44	3.1
1	1.82	0.250	1.141 0.785	0.210	0.205	10	0.084	2.80	3.7
1 1/4	2.16	0.250	1.484 1.130	0.230	0.220	10	0.091	3.01	4.4
1 1/2	2.46	0.281	1.714 1.308	0.260	0.250	10	0.106	3.39	5.2
2	3.06	0.344	2.188 1.657	0.295	0.280	8	0.121	4.03	5.9
2 1/2	3.63	0.375	2.609 2.095	0.325	0.315	8	0.139	4.29	6.9
3	4.38	0.438	3.250 2.594	0.401	0.401	8	0.160	7.50	9

NOTE: (a) The contact diameter of the male/female end is affected by the waterway bore (Column D). The manufacturer shall consider the relationships between the contact point and waterway diameter in his design.

| 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.

Standard Name	Description
ASME	
B1.1-2003 (R2008)	Unified Inch Screw Threads (UN and UNR Thread Form)
B1.20.1-2013	Pipe Threads, General Purpose (Inch)
B16.11-1991	Forged Fittings, Socket-Welding and Threaded (historical)
B36.10M-2015	Welded and Seamless Wrought Steel Pipe
ASTM	**Standard Specification for:**
A105/A105M-14	Carbon Steel Forgings for Piping Applications
A182/A182M-18	Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
A234/A234M-18	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
A312/A312M-17	Seamless, Welded and Heavily Cold Worked Austenitic Stainless Steel Pipe
A350/A350M-18	Carbon and Low-Alloy Steel Forgings Requiring Notch Toughness Testing for Piping Components
A403/A403M-18	Wrought Austenitic Stainless Steel Piping Fittings
A420/A420M-16	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
B366/B366M-17	Factory-Made Wrought Nickel and Nickel Alloy Fittings
B462-15	Forged or Rolled UNS N06030, UNS N06022, UNS N06035, UNS N06200, UNS N06059, UNS N10362, UNS N06686, UNS N08020, UNS N08367, UNS N10276, UNS N10665, UNS N10675, UNS N10629, UNS N08031, UNS N06045, UNS N06025, UNS R20033 Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service
B564-17a	Nickel Alloy Forgings
MSS; ANSI/MSS	
SP-25-2018	Standard Marking System for Valves, Fittings, Flanges, and Unions

The following organizations appear in the above list:

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
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 127 Park Street, NE Vienna, VA 22180-4602

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

ANSI/MSS SP-25	***Standard Marking System for Valves, Fittings, Flanges, and Unions***
ANSI/MSS SP-96	***Terminology for Valves, Fittings, and Their Related Components***

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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The Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry is a non-profit technical association organized for development and improvement of industry, national and international codes and standards for Valves, Valve Actuators, Valve Modifications, Pipe Fittings, Flanges, Pipe Hangers and Supports, and Associated Seals. Since its establishment in 1924, MSS has been dedicated to developing standards for national and global applications, in cooperation with other standardizing bodies and regulatory authorities.

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