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**Specification for
Steel pipe fittings,
screwed and socket-welding
for the petroleum industry**

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British Mechanical Engineering Confederation	Department of Trade and Industry, Oil
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*British Steel Industry	

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British Steel Corporation	Engineering Equipment Users' Association
British Valve Manufacturers' Association	National Association of Drop Forgers and Stampers

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Foreword

This British Standard has been prepared under the authority of the Petroleum Equipment Industry Standards Committee.

It is the metric version of BS 3799 which has also been revised so as to include welding bosses and round and swaged nipples, for which there is a general requirement. Flush bushings, bull plugs and all 2000 lb fittings have been deleted as there is now negligible usage of these types. Non-preferred sizes of all items, and hexagonal nipples over 2 in. nominal size have also been omitted.

A wider range of materials has been introduced and the material references have been revised in line with the current materials standards.

The bore diameter of sockets has also been modified to enable pipe with dimensions in accordance with ISO/R 64 (BS 3600) to be used in addition to pipe with the dimensions given in BS 1600 (API).

Certain measurements, notably nominal sizes, have not been converted into metric units since the use of imperial units in such cases follows established international practice in the petroleum industry; for this reason and also to retain identification, the designations 3000 lb and 6000 lb have been maintained.

In order to ensure interchangeability requirements, ANSI B16.11, ASTM 234 and ASTM A403 have been taken into account in the preparation of this document.

Acknowledgment is made to the American National Standards Institute (ANSI), the American Society for Testing Materials (ASTM), and the American Petroleum Institute (API) for data used in this standard.

British Standard Specification for

Steel pipe fittings, screwed and socket-welding for the petroleum industry

1. General

1.1 Scope

This British Standard specifies requirements for forged carbon and alloy steel screwed and socket-welding fittings for use in the petroleum and petrochemical industry.

Screwed fittings specified in this standard are intended for assembly with pipe threaded in accordance with API Std. 5B or ANSI B2.1. (N.P.T.)

Socket-welding fittings specified in this standard are primarily intended for assembly with plain end pipe dimensioned in accordance with BS 1600 and API Std. 5L. It should be noted, however, that with the exception of nominal size $2\frac{1}{2}$ in (65 mm) the socket dimensions are also suitable for use with plain end pipe dimensions in accordance with BS 3600 (ISO/R 64). See Notes to Purchaser (Appendix A) and Tables 13 and 16.

This standard provides for the following:

(1) Screwed fittings:

- Elbows, 90° and 45°
- Crosses
- Tees
- Couplings and half-couplings
- Caps
- Square, hexagonal and round head plugs
- Hexagonal head bushings
- Hexagonal and round nipples
- Unions
- Welding bosses
- Swage nipples*

(2) Socket-welding fittings:

- Elbows, 90° and 45°
- Crosses
- Tees
- Couplings and half-couplings
- Caps
- Unions
- Welding bosses
- Swage nipples*

NOTE. The Standards referred to in this standard are listed on the inside back cover.

1.2 Sizes and size identification

The size of a fitting is identified by the nominal size of the pipe with which it is to be used.

For reducing fittings, the openings are given in the alphabetical sequence shown in Fig. 1, the run openings being stated first, followed by the outlet opening(s). In each case, the larger opening is specified first.

* These fittings may be ordered in any combination of end preparation (see Table 12 with footnote).

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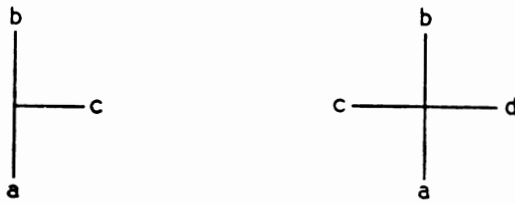


Fig. 1. Designation of outlets

Fittings of the following nominal sizes are included:

- (1) Screwed: $\frac{1}{8}$ in (6 mm) up to and including 4 in (100 mm).
- (2) Socket-welding: $\frac{1}{8}$ in (6 mm) up to and including 3 in (80 mm).

1.3 Designation

Fittings to this standard shall be designated as 3000 lb and 6000 lb. These designations represent the maximum cold non-shock working pressures of the fittings in pounds force per square inch. For convenient reference, schedule numbers of pipe normally used with these fittings are as follows:

Designation	Screwed fittings	Socket-welding fittings
3000 lb	Schedule 80	Schedule 80
6000 lb	Double extra strong	Schedule 160

Bore dimensions given in the relative tables for 3000 lb socket-welding fittings correspond to Schedule 40 pipe.

1.4 Pressure/temperature ratings

Pressure/temperature ratings are listed in Table 1.

Solid plugs and bushings do not carry specific ratings and are intended for use with screwed fittings of any of the designations shown in 1.3.

1.5 Manufacture

Fittings may be produced by any of the following recognized processes:

- (1) Forging: elbows, crosses, tees.
- (2) Forging or machining from bar stock: caps, bushings, hexagonal nipples, pipe plugs, unions.
- (3) Forging, or machining from bar stock or seamless pipe: couplings, half-couplings, welding bosses, round and swage nipples.

This standard does not cover fittings which have been fabricated by welding.

1.6 Certification

By agreement between the purchaser and the manufacturer, the basis of acceptance by the purchaser of the fittings covered by his order may be a certificate stating that such fittings comply with the requirements of this standard, and that the material from which they are made has the chemical and physical characteristics specified in the appropriate standards listed in Table 3.

2. Design

2.1 Screwed fittings

Screwed fittings shall be designed to withstand the stresses resulting from assembly.

For this purpose, elbows, tees and crosses shall be designed with wide reinforcing bands of heavy section connecting at the crotch of the fitting, resulting in additional wall thickness over the full length of the tapped ends. Screwed couplings, caps and similar fittings may have this additional wall thickness provided over their full length.

2.2 Screwed and socket-welding unions

These unions shall have integral steel-to-steel seats of the ball-to-cone seat type providing a concentric line contact. Cone-to-cone seat type may be supplied subject to agreement by the purchaser.

CAUTION. Unions should only be used as complete assemblies because component parts of unions made by different manufacturers, or component parts of different types of unions made by the same manufacturer, are not necessarily interchangeable.

2.3 Threading

Screwed fittings shall be taper threaded in accordance with API Std. 5B or ANSI B2.1. (N.P.T.)

Female and male entering threads shall be chamfered in accordance with the requirements of the relevant standard.

All fittings shall be threaded concentrically except that the actual and theoretical axes of the threads may diverge by not more than 1 in 200.

2.4 Dimensions of screwed fittings

The dimensions of screwed fittings shall be in accordance with Tables 4 to 12; except where minimum dimensions are given, these dimensions are nominal and are subject to normal manufacturing tolerances.

Except for hexagon nipples, all reducing fittings shall have the same centre-to-end and end-to-end dimensions and band diameters as an equal fitting corresponding in size to the largest opening in the reducing fitting.

2.5 Dimensions of socket-welding fittings

The dimensions of socket-welding fittings shall be in accordance with Tables 13 to 16.

One of the principles of this standard is the maintenance of a fixed position for the bottom of the socket with reference to the centre line of the fitting.

Reducing fittings shall have the same centre-to-bottom of socket dimensions as an equal fitting corresponding in size to the largest opening in the reducing fitting.

2.6 Tolerances for socket-welding fittings

The dimensions of fittings specified in Tables 13 to 16 shall be subject to the tolerances given in Table 2.

2.7 Workmanship and finish

Fittings complying with this standard shall be free from harmful defects and shall have a workmanlike finish.

Socket-welding fittings shall be faced at the ends at right angles to the axes.

The seats of unions shall be effectively protected against rust, during transit and storage.

3. Materials

Fittings to this standard shall be made of materials complying with one of the standards listed in Table 3, unless the use of other materials is agreed between purchaser and manufacturer.

4. Marking

4.1 Method of marking

The method of marking used shall not be harmful to the fittings.

Hard stamping is permissible only by roller stamping. Stamping shall be done lightly and carefully so as to minimize the notch effect and not so deep as to cause cracks or reduce the wall thickness of fittings below the minimum allowed. Stamping shall be applied prior to any final heat treatment when appropriate.

4.2 Required markings

Solid plugs, bushings and hexagonal nipples shall be clearly and indelibly marked with the following:

- (1) Manufacturer's name or trademark.
- (2) Material identification symbol (not required for carbon steel WPB).

All other fittings shall be clearly and indelibly marked with the following:

- (1) Manufacturer's name or trademark.
- (2) Material identification symbol (not required for carbon steel WPB).
- (3) Designated pressure rating.
- (4) Nominal size in inches (this may be omitted from reducing fittings). Example of markings:
 - a. A.B.Co.
 - b. WP1
 - c. 3000 lb
 - d. 2

4.3 Permissible omission of markings

Where the size of fittings does not permit full markings, these may be omitted in the following sequence:

- (1) Nominal size
- (2) Designated pressure rating
- (3) Manufacturer's name or trademark.

5. Inspection and test

5.1 Impact testing

Fittings ordered for use in low temperature services shall be subject to the requirements specified in the relevant material specification and in accordance with the requirements of BS 131: Part 2 and if so specified by the purchaser.

5.2 Hydrostatic testing

Hydrostatic testing of fittings other than unions is not required by this standard, but all fittings shall be capable of withstanding a hydrostatic test pressure of 1.5 times their designated pressure rating (see 1.4). This test shall be applied only when specified in the purchaser's order.

All unions shall be subjected to a seat test by the application of an internal air pressure of 20 bar* whilst the fitting is completely immersed in water or light oil.

5.3 Inspection

The purchaser or his representative shall, for the purpose of inspection, have free access at all reasonable times to those parts of the manufacturer's works engaged on the purchaser's order. He shall be afforded all reasonable facilities for satisfying himself that the fittings are being manufactured in accordance with this standard.

5.4 Test facilities

The manufacturer shall supply the material required for testing, supply and prepare the necessary test pieces, and supply the labour and appliances for such testing as may be carried out on his premises in accordance with this standard. In the absence of facilities at his own works for making the prescribed tests, the manufacturer shall arrange for the tests to be carried out elsewhere.

* 1 bar = 10^5 N/m² = 10^5 Pa.

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Table 1. Pressure/temperature ratings

Bar/°C

Material	WPA WPB		WPLO +		WP1		WP11		WP22		WP5		WPL3 +		WP304		WP304 H		WP304 L	
Temp. °C	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb	3000 lb	6000 lb
–100/–50													207	414	177	354			147	295
–50/–30			207	414									207	414	177	354			147	295
–30/+40	207	414	207	414	207	414	207	414	207	414	207	414	207	414	177	354	177	354	147	295
50	206	411	207	414	207	414	207	414	207	414	207	414	206	411	172	345	172	345	147	294
75	203	406	203	406	203	406	203	406	203	406	203	406	203	406	165	330	165	330	146	292
100	200	401	200	401	200	401	200	401	200	401	200	401	200	401	155	311	155	311	142	285
125	198	396	198	396	198	396	198	396	198	396	198	396	198	396	148	297	148	297	133	266
150	196	392	196	392	196	392	196	392	196	392	196	392	196	392	142	284	142	284	123	247
175	194	388	194	388	194	388	194	388	194	388	194	388	194	388	136	272	136	272	114	229
200	192	384	192	384	192	384	192	384	192	384	192	384	192	384	130	260	130	260	105	211
225	188	377	188	377	188	377	188	377	188	377	188	377	188	377	125	250	125	250	99.5	199
250	183	366	183	366	183	366	183	366	183	366	183	366	183	366	120	240	120	240	94	188
275	174	349	174	349	174	349	174	349	174	349	174	349	174	349	116	231	115	231	90	180
300	165	331	165	331	165	331	165	331	165	331	165	331	165	331	112	224	112	224	87.5	175
325	155	311	155	311	155	311	155	311	155	311	155	311	155	311	108	217	108	217	85	170
350	145	290	145	290	146	292	146	292	146	292	146	292	145	290	105	210	105	210	82.5	165
375	134	268	134	268	137	274	137	275	137	275	137	275			101	203	101	203	80.5	161
400	122	244	122	244	127	254	128	257	128	257	128	257			98	196	98	196	78.5	157
425	106	212	106	212	118	236	120	241	120	241	120	241			95	190	95	190	76.5	153
450	89	178	89	178	109	218	111	223	111	223	111	223			92	184	92	184		
475	70	140	70	140	99.5	199	103	206	103	206	103	206			89.5	179	89.5	179		
500	51.5	103	51.5	103	90	180	94.5	189	94.5	189	94.5	189			88	176	88	176		
525	33.6	67.2	33.6	67.2	79	158	86	172	86	172	86	172			87	174	87	174		
550							67	134	68.5	137	63	126			85.5	171	85.5	171		
575							49.2	98.4	51.5	103	44.8	89.6			80.5	161	80.5	161		
600							35.8	71.7	38.8	77.6	30	60			69.5	139	69.5	139		
625							22.8	45.6	28	56	20.8	41.7			55	110	55	110		
650							11.4	22.8	19.4	38.8	14.4	28.8			43.8	87.7	43.8	87.7		
675															32.9	65.8	32.9	65.8		
700															25.2	50.5	25.2	50.5		
725															19.3	38.7	19.3	38.7		
750															15.1	30.2	15.1	30.2		
775															11.7	23.5	11.7	23.5		
800															8.7	17.5	8.7	17.5		