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Indian Standard

SPECIFICATION FOR FORGED STEEL, SOCKET-WELDING FITTINGS

(*First Revision*)

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**BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002**

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Indian Standard

SPECIFICATION FOR FORGED STEEL, SOCKET-WELDING FITTINGS (*First Revision*)

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Indian Standard
SPECIFICATION FOR
FORGED STEEL, SOCKET-WELDING FITTINGS
(*First Revision*)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 31 May 1984, after the draft finalized by the Steel Tubes, Pipes and Fittings Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first issued in 1968. On the basis of the experience gained during these years, it has been decided to revise this standard. After considering the needs of the industry the committee has felt it desirable to include the material requirements and convert it into a specification covering all the requirements.

0.3 While formulating this standard, due consideration has been given to the trade practices followed in the country in this field. Due consideration has also been given to international co-ordination among the standards prevailing in different countries. Assistance has been derived from the following publications:

ASTM A 105-1979 Forgings, carbon steel, for piping components.
American Society for Testing and Materials

ANSI B 16. 11-1973 Forged steel fittings, socket — Welding and threaded

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Rules for rounding off numerical values (revised).

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1. SCOPE

1.1 This standard covers the requirements for forged carbon steel socket-welding fittings.

2. DESIGNATION

2.1 The steel pipe fittings covered by this standard shall be designated as Class 20 and Class 40 depending on the nominal, ambient non-shock working pressure of the fittings in N mm². The size of the fittings shall be identified by the 'Nominal pipe size' given in Table 1.

3. SUPPLY OF MATERIALS

3.1 General requirements relating to the supply of materials shall be as laid down in IS : 1387-1967*.

4. CHEMICAL COMPOSITION AND MECHANICAL REQUIREMENTS

4.1 **Chemical Composition** — The steel from which forged steel socket welding fitting is made shall conform to the chemical composition given below:

Elements	Composition, Percent	Variation from the Specified Limits, Percent
Carbon	0.35, Max	Up to 0.25 ± 0.02 from 0.25 ± 0.03 to 0.35
Manganese	0.60-1.05	—
Phosphorus	0.040, Max	+0.005
Sulphur	0.050, Max	+0.005
Silicon	0.35, Max	± 0.03

NOTE — For each reduction of 0.01 percent below the specified carbon, Max (0.35 percent), an increase of 0.06 percent manganese above the specified, Max (1.05 percent) will be permitted up to a maximum of 1.35 percent.

4.1.1 Unless otherwise stated by the purchaser forgings shall be heat treated by annealing or normalizing or normalizing and tempering.

4.1.2 **Annealing** — The procedure for annealing shall consist of allowing the forgings immediately after forging or rolling to cool to a temperature below 538°C. They shall then be reheated to a temperature between 843°C and 927°C to refine the grain (a group thus reheated being known as an 'annealing charge') and allowed to cool uniformly in the furnace.

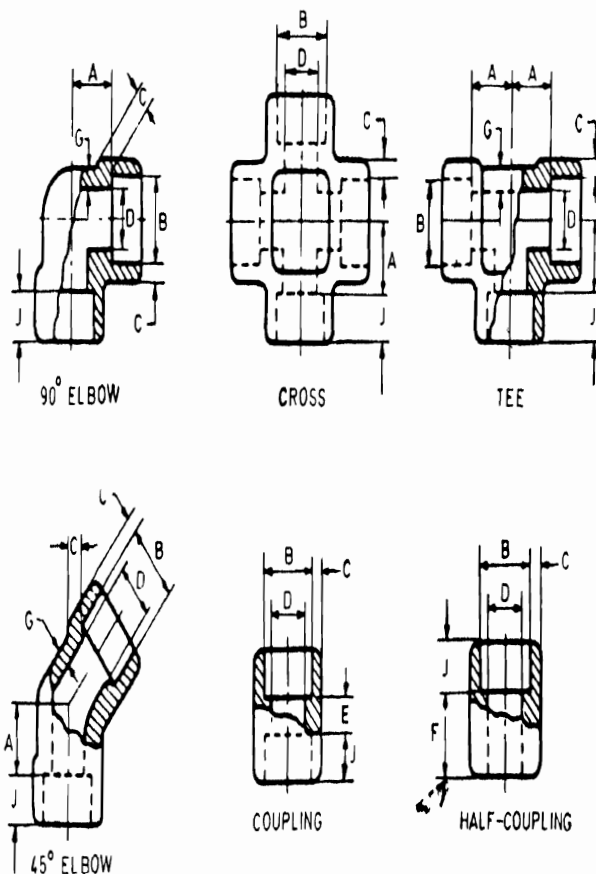
*General requirements for the supply of metallurgical materials (first revision).

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TABLE 1 DIMENSIONS AND TOLERANCES OF SOCKET WELDING FITTINGS

(Classes 2.1, 5.3)

All dimensions in millimetres.



NOMINAL PIPE SIZE	BORE DIAMETER (B)	DEPTH OF SOCKET (J)	SOCKET WALL THICKNESS (C)				BORE DIAMETER OF FITTING (D)		CENTRE TO BOTTOM OF SOCKET (a) (A)				LAYING LENGTH		TOLERANCE			BODY WALL THICKNESS (G)	
			Class 20		Class 40		Class 20	Class 40	90° Elbs Tees and Cross		45° Elbs		Cou- plings (E)	Half- Couplings (F)	(A)	(E)	(F)	Class 20 Min	Class 40 Min
			Avg	Min	Avg	Min			Class 20	Class 40	Class 20	Class 40							
			(1)	(2)	(3)	(4)	(5)	(6)					(7)	(8)	(9)	(10)	(11)	(12)	(13)
6	10.7 10.9	10	3.20	3.20	3.95	3.45	7.6 6.1	4.8 3.2	12 10	12 10	9 7	9 5	8 15	17 15	0.8 1.5	1.5 0.8	0.8 3.00	2.40 3.70	3.15 4.00
8	14.1 14.4	10	3.80	3.30	4.60	4.00	10.0 8.5	7.1 5.6	12 10	17 13	9 7	9 5	8 15	17 15	0.8 1.5	1.5 3.0	0.8 1.5	3.00 3.20	3.70 4.00
10	17.5 17.8	10	4.00	3.50	5.05	4.35	13.3 11.8	9.9 8.4	15 12	17 14	9 6	13 10	9 3	19 16	1.5 3.0	3.0 1.5	1.5 3.75	3.20 4.80	4.00 4.80
15	21.7 22.0	10	4.65	4.10	5.95	5.20	16.6 15.0	12.5 11.0	17 14	21 18	13 10	14 11	13 6	24 21	1.5 3.0	3.0 1.5	1.5 3.90	3.75 5.55	4.80 5.55
20	27.1 27.3	13	4.90	4.25	6.45	6.05	21.7 20.2	16.3 14.8	21 18	24 21	14 11	16 13	13 6	25 22	1.5 3.0	3.0 2.0	1.5 4.55	3.90 6.35	5.55 6.35
25	33.8 34.0	13	5.70	5.00	7.90	6.95	27.4 25.9	21.5 19.9	24 20	29 25	16 12	19 15	17 9	31 27	2.0 4.0	4.0 2.0	2.0 5.10	4.55 7.15	6.35 7.15
32	42.5 42.8	13	6.05	5.30	7.90	6.95	35.8 34.3	30.2 28.7	29 25	34 30	19 15	23 19	17 9	32 28	2.0 4.0	4.0 2.0	2.0 5.10	4.85 7.15	6.35 7.15
40	48.6 48.9	13	6.35	5.55	8.90	7.80	41.7 40.1	34.7 33.2	34 30	40 36	23 19	27 23	17 9	34 30	2.0 4.0	4.0 2.0	2.0 5.10	5.10 7.15	7.15 7.15
50	61.1 61.4	16	6.95	6.05	10.90	9.50	53.5 51.7	43.6 42.1	40 36	43 39	27 23	31 27	23 15	49 39	2.0 4.0	4.0 2.0	2.0 5.55	5.55 8.75	8.75 8.75
65	73.8 74.2	16	8.75	7.65			64.2 61.2		44 39		31 27	24 20	24 14	45 40	2.5 5.0	5.0 2.5	2.5 7.00	7.00 9.55	9.55 9.55
80	89.8 90.2	16	9.50	8.30			79.5 46.4	60 65		60 65	34 29	24 14	24 42	47 42	2.5 5.0	5.0 2.5	2.5 7.60	7.60 11.10	11.10 11.10
100	115.4 115.8	19	10.70	9.35			103.8 100.7		69 64		44 39	24 14	24 45	50 45	2.5 2.5	2.5 2.5	2.5 8.55	8.55 13.50	13.50 13.50

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4.1.3 Normalizing — The procedure for normalizing shall consist of allowing the forgings immediately after forging or rolling to cool to a temperature below 538°C. They shall then be uniformly reheated to a temperature between 843°C and 927°C to refine the grain (a group thus reheated being known as a 'normalizing charge') and allowed to cool in still air.

4.1.4 Tempering — The procedure for tempering shall consist of heating the forgings to a temperature between 593°C and the lower transformation temperature for one hour per 25 mm of maximum section thickness.

4.2 Mechanical Requirements — The steel from which forged steel socket welding fitting is made shall conform to the mechanical requirement as follows:

Tensile strength, <i>Min</i> N/mm ²	485
Yield strength, <i>Min</i> N/mm ²	250
Elongation on standard gauge	22
Length, <i>Min</i> percent	
Hardness, <i>Max</i> BHN	187

4.3 The steel given in Class 2 and Class 3 of IS : 1875-1978* will be suitable for the manufacture of forged steel socket welding fittings.

5. DIMENSIONS

5.1 Concentricity of Bores — The socket and fitting bores shall be concentric within a tolerance of 0.8 mm for all sizes. Opposite socket bores shall be concentric within a tolerance of 1.6 mm for all sizes.

5.2 Coincidence of Axes — The maximum allowable variation in the alignment of the fitting bore and socket bore axes shall be 0.5 percent. The maximum allowable variation in alignment of threads shall be 0.5 percent.

5.3 The dimensions of fitting shall be in accordance with Table 1. Reducing fittings shall have the same centre-to-bottom of socket dimensions as an equal fittings corresponding in size to the largest opening in the reducing fittings. The ends of socket-welding fittings shall be at right angles to the axis and provide adequate surface for the required fillet weld (see Fig. 1).

5.3.1 In fixing the dimensions of pipe fittings, the bottom of the socket is maintained at a fixed position with reference to the centre line of the fittings.

*Carbon steel billets, blooms, slabs and bars for forgings (*fourth revision*).

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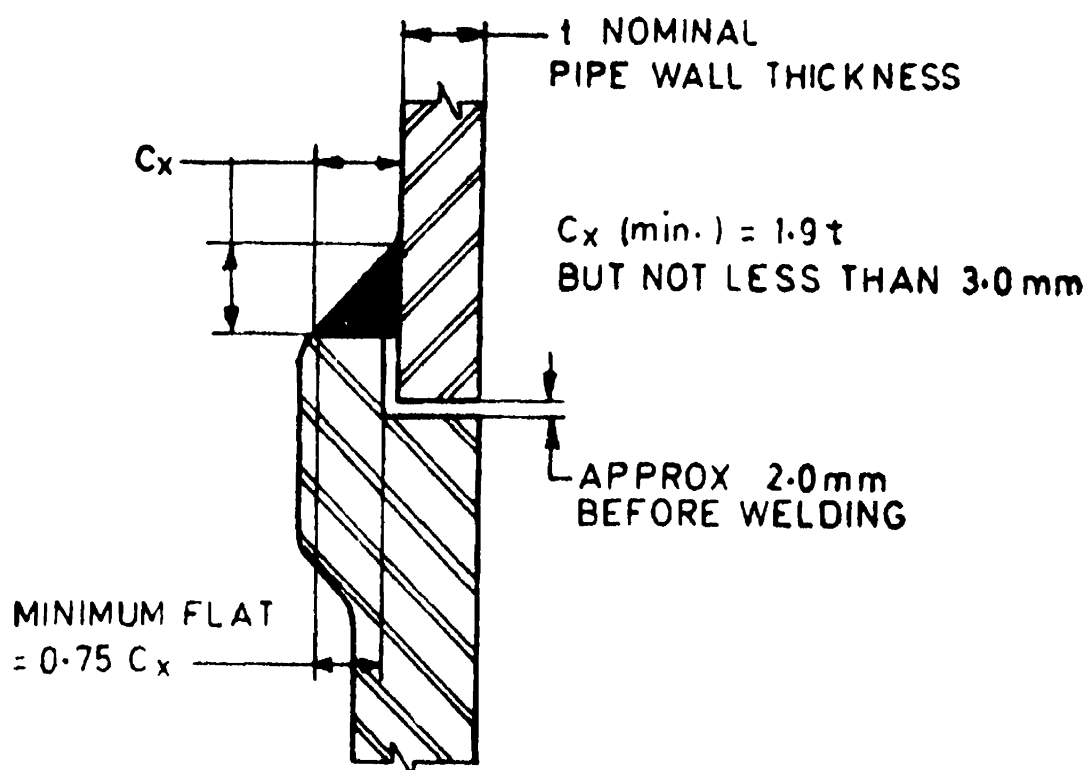


FIG. 1 WELDING DIMENSIONS FOR SOCKET WELDING COMPONENTS

6. MECHANICAL TESTS

6.1 The tensile and hardness test shall be carried out in accordance with IS : 1608-1972*, IS : 1500†, IS : 150‡ and IS : 1586§ respectively. The test shall be carried out for each heat. Specimens shall be obtained from production forging, after heat-treatment when heat treatment is required or from separately forged test blanks, prepared from the stock used to make the finished product.

6.1.1 Repeat heat treatment if the results of the mechanical test do not conform to the requirements specified the manufacturer may heat-treat or reheat-treat the forgings as applicable and repeat the test specified in 6.1.

6.2 Hydraulic Test — Where so agreed to between the manufacturer and the purchaser, the fittings ability to withstand bursting shall be gauged by comparing the behaviour of testing with the calculated bursting strength of straight pipe of the same designation, size, wall thickness, materials and the provisions for hydro static pressure test.

*Method for tensile testing of steel products (*first revision*).

†Method for Brinell hardness test for steel (*first revision*).

‡Method for Vickers hardness test for steel (*first revision*).

§Method for Rockwell hardness test (B and C scales) for steel (*first revision*).

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6.3 Hydrostatic testing of fittings is not required in this standard. All fittings shall be capable to withstand without leakage, the test pressure equal to that prescribed in the specification for pipes with which the fitting marking identifies and without impairing their serviceability.

7. PIPE SIZE AND MAXIMUM THICKNESSES

7.1 Different sizes and maximum thickness recommended for use for different classes are given in Table 2.

TABLE 2 OUTSIDE DIAMETERS AND THICKNESSES OF FITTINGS

NOMINAL PIPE SIZE mm	OUTSIDE DIAMETER mm	BODY WALL THICKNESS IN mm	
		Class 20	Class 40
6	10.3	2.40	3.15
8	13.7	3.00	3.70
10	17.1	3.20	4.00
15	21.3	3.75	4.80
20	26.7	3.90	5.55
25	33.4	4.55	6.35
32	42.2	4.85	6.35
40	48.3	5.10	7.15
50	60.3	5.55	8.75
65	73.0	7.00	9.55
80	88.9	7.60	11.10
90	101.6	8.10	—
100	114.3	8.55	13.50
125	141.3	9.55	15.90
150	168.3	10.97	18.25
200	219.1	12.70	23.00
250	273.1	15.10	28.60
300	323.9	17.50	33.30
350	355.6	19.00	35.70
400	406.4	21.45	40.50
450	457	23.85	45.25
500	508	26.20	50.00
550	559	28.60	53.95
600	610	30.95	59.55

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8. MARKING

8.1 The product may also be marked with Standard Mark.

8.2 The product may also be marked with Standard Mark.

8.3 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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