



CORPORATE STANDARD

AA 085 14 02

Rev. No. 04

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TECHNICAL, DELIVERY CONDITIONS FOR ANSI-PIPE FITTINGS

1.0 SCOPE:

This standard stipulates the technical delivery conditions for socket-welding fittings like elbows, tees, couplings etc. to ANSI: B16.11 and seamless butt-welding fittings like elbows, tees, reducers etc. to ANSI: B16.28.

2.0 TECHNICAL REQUIREMENTS

This socket-welding fittings shall comply with ANSI: B16.11 and butt-welding fittings with ANSI: B16.28 with the following specific requirements.

2.1 Pressure class, schedule and size : Pressure class and size for socket-welding fitting, schedule and size for butt-welding fittings shall be as specified in the enquiry/order.

2.2 Material Specification: The material of the fittings shall be as per enquiry/order. The material shall generally comply with the following, unless otherwise specified.

a) Socket welding fittings: Socket welding fittings shall be manufactured by forging to the following material specification:

Carbon Steel (Low Temperature Service)	: ASME : SA 350 Gr : LF1
Carbon Steel (High Temperature Service)	: ASME : SA 105
Alloy Steel (High Temperature Service)	: ASME : SA 182 Gr : F22
Stainless Steel	: ASME : SA 182 Gr : F321

b) Butt-Welding fittings: Butt-welding fittings shall be manufactured as per the relevant standards to the following material specification:

Carbon Steel (Low Temperature Service)	: ASME : SA 420 Gr : WPL6
Carbon Steel (High Temperature Service)	: ASME : SA 234 Gr : WPB
Alloy Steel (High Temperature Service)	: ASME : SA 234 Gr : WP11
	: ASME : SA 234 Gr : WP22
Stainless Steel	: ASME : SA 403 Gr : WP321

2.3 Heat treatment: The fittings shall be properly heat treated as per the relevant material specification:

2.4 Dimensions, Tolerances and Finish : The dimensions and tolerances, shall be strictly as per ANSI: B16.11 for forged steel fittings, socket welding and threaded, B16.9 for factory made wrought steel Butt-Welding fittings. For allowable imperfections and finish of the fittings relevant clause as per ASME : SA 234/SA 403/SA 420 shall be applicable for carbon alloy and stainless steel fittings.

Revisions :

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APPROVED :

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All fittings shall be shot blasted both inside and outside to remove rust, scale and other foreign materials. The surface shall be clean, smooth and without any scales, burrs etc. Vendor shall note the method to be employed in their Quality Assurance Plan for approval by BHEL representative/Customers.

- 2.5 Edge Preparation:** Unless otherwise specified, the butt welding fittings shall be supplied with edge preparation for welding with the connecting pipe. The edge preparation shall be as per ANSI : B 16. 25.

3.0 CHEMICAL COMPOSITION AND PROCESS:

- 3.1** Carbon percentage shall be limited as specified in the following table:

Sl No.	Grade	Connecting pipe wall thickness	C%
1.	A105, WPC	All	0.25
2.	WPB, WPBW	All	0.25

- 3.2** Fittings shall be of seamless construction only unless otherwise specified in the purchase order. Fittings of nominal bore NB 50 and below shall be of forged construction only.

- 3.3** Fittings shall be forged, wherever specified in the purchase order. The forgings must be as close as possible to the final shape and size.

- 3.4** All the plates used for manufacturing of plate formed fittings shall be ultrasonically tested by either of the following:

- i) ASME SA 435 and acceptance standards as in SA 435 except that adjacent discontinuity indications shall be separated from each other by a distance equal to or no longer than the larger of the indications, unless both the adjacent defects can be contained in a circle of diameter equal to the acceptance standards of a single defect.

- ii) ASME SA 578 and acceptance standard shall be as per Level-1 of SA 578

4.0 INSPECTION AND CERTIFICATION:

- 4.1 Mechanical and Chemical Testing:** Material used for manufacture of the fittings shall be tested for mechanical properties and chemical composition as relevant material standards.

- 4.2 Magnetic particle Examination:** Knuckle of reducers, outer bend portion of elbows and neck portion of tees shall be magnetic particle examined after final heat treatment in accordance with practice ASME SE 709 for all carbon steel and alloy steel fittings for all schedule for sizes 2" inclusive and above.

- 4.3 Liquid Penetrant Examination:** Knuckle of reducers, outerbend portion of elbows and neck portion of tees shall be liquid penetrant examined after final heat treatment in accordance with practice ASME SE 165 for all stainless steel fittings for all schedules for sizes 2" inclusive and above.

- 4.4 Acceptance Criteria for MPE and LPE Tests:** The acceptance criterial for MPE and LPE tests shall be in accordance with Appendix 6 and 8 of ASME, Sec. VIII Div. 1

All surfaces to be examined shall be free of :

- relevant lines indications.
- relevant rounded indications greater than 3/16 inch.
- Four or more relevant rounded indications in a line separated by 1/16 inch or less (edge to edge)
- An indication of imperfection may be larger than the imperfection that causes it, however, the size of the indication is the basis for acceptance evaluation



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4.5 Wrinkless: The inner bend portion of Elbows shall be free from wrinkles and Tool marks.

5.0 CERTIFICATE:

5.1 All fittings shall be delivered along with test certificates in English.

5.2 Fittings to material specification ASME SA 105, SA 182 Gr.F22, SA 234 Gr.WPB and WP22 shall be inspected and the test certificates shall be countersigned by an inspecting authority approved under Appendix "C" of Indian Boiler Regulations.

5.3 Fittings to material specification ASME 350 Gr.LF1, SA 182 Gr.F321, SA 420 Gr.WPL6 and SA 403 Gr.WP 321 shall be subjected to inspection by authorities nominated by BHEL and the test certificates shall be countersigned by them.

5.4 Three original Test certificates shall be submitted.

6.0 GUARANTEE CERTIFICATE:

The supplier shall furnish a guarantee certificate stating that fittings supplied are capable of withstanding without failure, leakage or impairment of their serviceability, a hydrostatic test pressure equal to that prescribed for the specified matching pipe of equivalent material.

7.0 QUALITY PLAN:

A quality plan incorporating the process adopted by the supplier and conforming to the requirements of this specification shall be submitted for approval. Manufacturing shall commence only after the approval of the quality plan by BHEL.

8.0 MARKING, PRESERVATION AND PACKING:

8.1 **Marking:** The following details shall be punched on each fitting:

- a) Manufacturer's name and trade mark
- b) Pressure class (in case of socket welding fittings)
- c) Nominal size
- d) Schedule No. (in case of butt welding fittings)
- e) Type of fitting
- f) Material specification grade
- g) Melt No.
- h) Test certificate number
- i) Mark of inspection authority

8.2 Presentation:

Before despatch, the fittings shall be dried and cleaned and the entire surface shall be well coated with a good quality rust preventive coating that will not become fluid and run-off at 65°C.

8.3 Packing:

All fittings shall be provided with HDPE end covers to protect the weld edge preparation and to protect the internal surfaces. The fittings shall be wrapped by bitumen paper/tar paper/polyethylene paper to avoid water ingress during transit/handling in transporter's godown. Fittings shall be packed in a sound closed wooden/steel box.

9.0 REFERRED STANDARDS (Latest Publications Including Amendments):

- 1) ANSI B 16.9, B 16.11, B 16.25 & B 16.28
- 2) ASME SA 105, SA 182, SA 234, SA 350, SA 403, SA 420 SA, SA 435, SA 578, SE 165 & ASME SE 709.

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ANNEXURE-I : TEST CERTIFICATE PROFORMA FOR FORGINGS

SUPPLIER'S NAME AND ADDRESS TEST CERTIFICATE FOR FORGINGS											
1. Customer;						9. Reduction Ratio } Ingot to Bloom Bloom to Blank					
2. TC No. & Date;						10. Batch No.;					
3. PO No.;						11. Heat/Melt No.					
4. Process of Melting Ingot;						12. Spec. No.					
5. Deoxidisation Process;						13. Test Bar Size & Nos.					
6. Forging Method;						14. Supplier of the ingot/billet/ Bloom and TC reference.					
7. BHEL's Reference for Approval of Bloom											
8. Discard: Top _____%, Bottom _____%											
15. FORGINGS COVERED BY TEST CERTIFICATE											
S.No.		Drawing No. & Item No.				Description				Quantity & Weight	
16. CHEMICAL COMPOSITION (PERCENT)											
Element		C	Si	Mn	S	P					
As Per Specn.		Min.									
		Max.									
Actual Values											
17. HEAT TREATMENT (To be accompanied by Recorder Chart, Whenever called for)											
Condition		Heating Rate, °C/hr.		Temp. °C		Soaking Time, Hrs.		Cooling Rate, °C/hr		Cooling Medium	
18. MECHANICAL PROPERTIES											
		T.S. N/mm ²	Y.S. 0.5/0.2% Proof N/mm ²	% Elongation 5.65√So GL	% R.A. Min.	Hardness BHN (Min. 3 values)	Impact Value Joules	Bend Test			
								Angle of bend	Dia of mandrel	Result	
As Per Specn.		Min.									
		Max.									
Actual Values											
19. SURFACE FINISH (When called for in the order/drg.)											
20. DIMENSIONAL INSPECTION											
21. NON-DESTRUCTIVE TESTS											
Nature of Test		Acceptance level		Instrument used		Range		Results		Any other detail	
Ultrasonic											
Radiographic											
Dye penetrant/ Magnetic Particle											
22. METALLOGRAPHIC EXAMINATION (To be conducted if called for and photo micrographs to be attached along with a report)											
Location of Sample		Etchant used		Magnification		Constituent observed		Relative %			
Microstructure		Macroetch		Inclusion Rating							
23. OTHER TESTS IF ANY (MICROSCOPIC, SULPHUR PRINTS, ETC)											
24. IDENTIFICATION OF FORGINGS AS PER PURCHASE SPEC.											
We hereby certify that the items mentioned above have been tested and inspected in our presence and are found to be in accordance with drawings, specifications and purchase order.											
SIGNATURE, NAME & SEAL OF THE INSPECTING OFFICER DATE:						SIGNATURE, NAME & SEAL OF THE CHIEF OF QUALITY CONTROL/ CHIEF METALLURGIST OF THE SUPPLIER DATE:					
INSTRUCTIONS											
a) Details of all heat treatment processes carried out should be furnished sequentially in 17.											
b) Test certificates are to be furnished as per Purchase order and specification, in A4 size preferably in transparent paper.											
c) All the entries including signature should be in block colour ink.											
d) If testing is done by outside agencies, the original TCs shall be furnished.											
e) The actual TC may run into more than one A4 size paper, if needed, to facilitate filling up of details.											