

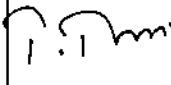


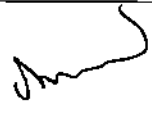






	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> <b>PIPING CENTRE, CHENNAI – 600 017.</b>			
Title :	Technical Delivery Conditions for Butt welded – fittings as per Indian Boiler Regulations.			
Specification No:	TDG : 102 Rev : 02			
Project :	ALL PROJECTS.			
Material :	ASME SA 234, SA 403, SA 105, SA 182			
Equipment :	Butt welded fittings.			
Accepted By:- Engineering				
Materials Management				
OP & C				
Rev : NO:-	01	02	03	04
Date :-	08/08/2003	21/10/2003		
Prepared / Revised by				
Reviewed / Approved by				
<u>Issued by Piping Centre / Quality Assurance</u>				Page 1 of 5

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BUTT WELDED - FITTINGS  
SA234, SA403, SA105, & SA182

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: TDG : 102 : 02  
: Dt : 21/10/2003

Revision	Date	Clause	Description
01	08/08/2003	----	Fully revised for better clarity. CI 2.0 e) added.
02	21/10/2003	2.0 ( c )	UT acceptance norm revised from Level A to B.

1.0 **CODES:-**

The fittings shall meet Indian Boiler Regulations, (IBR) in addition to the standards specified in the Purchase Order (PO).

2.0 **RAW MATERIALS:-**

- a) All pipes used for fittings shall meet the respective specification. The test certificate shall be furnished.
- b) All mother pipes used for fittings shall be subjected to a hydraulic test as per SA 530 or UT as per ASTM E 213 at the mill
- c) All plates used for fittings shall be UT tested as per S1 of SA578 and acceptance norms shall be as per Level B of SA578
- d) The raw material forging shall be ultrasonically tested as per SA 388 and the acceptance norm shall be as per AM 203.2 of ASME Sec VIII Div 2.
- e) Steel for SA 182 F11, F12 & F22 if indigenously procured, to be from following manufacturers approved under IBR for creep resistant steels: i ) Alloy Steel Plant ,Durgapur, ii )Tata Iron & Steel company, Jamshedpur & iii ) Mahindra Ugine Steel Company , Mumbai..

3.0 **PROCESS:-**

Process of manufacture shall conform to applicable standards.

All fittings shall be of seamless unless otherwise specified in the purchase order.

In case of welded fittings, the following shall be taken care.

The vendor's facility, WPS, PQR ,welder & welder qualification shall be approved by BHEL PC, prior to start of welding.

4.0 **HEAT TREATMENT:-**

All fittings shall be heat treated as below.

SA 234 WP B	- As per specification
SA 105,SA234 WP C	- Normalised
SA234 WP11/ WP12/ WP22/ WP91	- Normalised & Tempered
SA182 F11/ F12/ F22 /F91	- Normalised & Tempered
Stainless Steel :-	
SA 182 F304/ 316/ 321/ 347	- Solution annealed
SA 403 WP304/ 316/ 321/ 347	- Solution annealed

4.1 **FITTINGS:-**

- (A) Carbon content of SA 234 WPB, WPC, SA 105 fittings shall be restricted to 0.25% max.
- (B) All ferrous fittings shall be tested by MPI as per ASTM E-709 and SS fittings shall be LPI tested as per ASTM E 165.
- (C) One fitting of each specification, heat, heat treatment lot and size shall be subjected to Tension Test as per applicable standard.
- (D) All fittings of wall thickness above 6mm or NB 200mm and above shall be Ultrasonically Tested as per SA 388; acceptance norms shall be AM 203.2 of ASME section VIII Div.2.

- (E) All fittings shall have smooth surfaces, workman like finish and free from loose scales and defects like laps, seams, folds, cracks, pitting etc.. Repair by welding is NOT permitted.
- (F) Dimensions shall be as per ASME B16.9 or B16.28, Butt Weld edges shall be as given in Purchase Order. The ends of reducers shall have a straight portion of Minimum 13mm.
- (G) Hardness test shall be carried out on each fittings of WP91 / F91. For other fittings hardness shall be checked on 10% of the fittings.
- (H) In case welded fittings; all the welds shall be 100% RT tested and acceptance norms shall be UW 51 of ASME Sec VIII DIV-1
- (I) SUPPLEMENTARY TEST:- The test shall be carried out as indicated below, and the results shall be reported in the Test Certificate . (Not applicable for SA234 WPB Fitting)

Specification	Product Analysis One /heat/ size.	Tension Test One /heat/ HT lot/ size.
SA 105	Required	Required
SA 182F11/F12/F22/F91	Required	Required
SA 234WPC/WP11/WP12/WP22/WP91	Required	Required

- (J) Metallography:- Metallography shall be carried out one per heat, per size, per heat treatment lot of WP91 / F91 fittings.
- (K) Unless otherwise specified in the P.O SA 234 WP 11/12/22 fittings shall be supplied as per class1, SA 182 F11/12 shall be supplied as class 2, SA 182 F22 shall be of class 3 only.

## 5.0 MARKING, COLOUR CODING, PACKING AND PRESERVATION:-

All fittings shall be PUNCHED OR ETCHED with specification, Grade, Heat No, maker's emblem and Inspection Authorities Seal.

Fittings of size above 76mm shall in addition be stenciled with above details. Colour Coding shall be as below.

### COLOUR CODING:-

SA 234 WPB/WPBW	=	Red
WPC/SA105	=	Blue
WP11/SA182 F11	=	Green & White
WP12/SA182 F12	=	Black & Red
WP 22/SA182 F22	=	Blue & Red
WP91/ SA182 F91	=	Brown & Red
SA182 / SA 403 F/ WP 304	=	Blue & Yellow
316	=	Black & Green
321	=	Blue & Brown
347	=	Yellow & Black

**PACKING AND PRESERVATION :-**

All fittings except SS to be applied with resin type rust preventive coating with visibility to stenciled details on outside and either with rust preventive coating or rust inhibitor inside. SS fittings to be surface treated as per ASTM A380 both inside and outside. Ends to be closed, with end caps secured for storage and suitably packed in box/crate to avoid transit/other damages.

**6.0 INSPECTION & CERTIFICATION:-**

All fittings are to be Inspected at the manufacturer's works by the Inspection agencies / authorities as per IBR and as indicated in the P.O. Inspection certificate in IBR Form IIIC (for fittings under IBR purview) shall be submitted along with the Work Test Certificate countersigned by any of the above authorities and shall include the following.

1. Test Certificate Number & date.
2. BHEL P.O Number & Amendment Number
3. BHEL P.O. Serial Number
4. BHEL TDC Number
5. Size-wise Quantity
  
6. Specification, Grade & Year of code.
7. Heat/Melt Number
8. Steel making / forming process
9. Laddle Analysis of Raw Material and product analysis of fitting wherever applicable.
  
- \*10. Supplementary Test(Product analysis, Tension test..) results.
- \*11. Heat Treatment Chart.
- \*12. NDE report. (VISUAL,MPI, LPI,UT)
- \*13. Tensile Test Report
- \*14. Hardness Test Report
  
- \*15. Metallography as applicable.
- \*16. Dimensional conformance.
- \*17. Starting material details.
- \*18. RT test report / Results (for welded fittings)
- \*19. Guarantee of HTP shall be given as follows:- "Fittings 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".

\*Details furnished in the Tests certificate in lieu of chart/report is acceptable.