



**Bharat Heavy Electricals Limited  
(A Govt. of India Undertaking)**

Piping Centre , 80, G. N. Chetty Road, CHENNAI – 600 017  
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REF: ENQ NO: 4101200018

DT: 31.01.2012

Sub: Procurement of Forged fittings CS and AS - FITFG.

**Ref: Enquiry No: PC: 4101200018 dt 31.01.2012**

Please find the following tender documents for reference.

1. List of items and sample drawings
2. Tech. delivery condition TDG: 104 Rev 03.

Pre qualification is the criteria for consideration for other than BHEL approved vendors. After qualifying for registration, the new vendors may be considered for future requirements, in line with BHEL system and policy. Such vendors will not be considered for this enquiry.

**This is a limited tender and only vendors who are contacted through e-mail/courier may submit their offers. Offers from other vendors will not be considered for this enquiry.**

New vendors may download vendor registration forms from BHEL web site [www.bhel.com](http://www.bhel.com) and relevant data for formal registration.

Manager / Purchase  
BHEL / Piping Centre  
80,GN Road, T.Nagar  
Chennai-600017  
Ph: 044-28161243

SI No	MATERIAL	DESCRIPTION	Ind	QTY	TDC	DRG NO	CURR	UNIT RATE
1	921174760000	MATCHING PIECE 965 X 37 / 965 X 25 SA105		1	TDG 104 Rev 03	4-80-320-68293-R00		
2	921175750000	MACHINEDREDOD33.4X4.55/14X2.9SA182F22CL3		100	TDG 104 Rev 03	4-80-999-93258-R01		
3	921176660000	MATPCEOD 355.6X32 / 219.1X32 SA182F22CL3		4	TDG 104 Rev 03	4-80-320-73823-R00		
4	921176710000	MATCHING PIECE457.2X25/420X40SA182F22CL3		4	TDG 104 Rev 03	4-80-310-73832-R00		
5	921176730000	MATCHINGPCEOD600X46.6/508X25SA182F22CL3		4	TDG 104 Rev 03	4-80-311-74039-R00		
6	921176740000	MATCHINGPCE 578X35.6/508X25 SA182F22CL3		4	TDG 104 Rev 03	4-80-311-74040-R00		
7	925161930000	STUB OD 370 ID 150 L = 335 SA182F22CL3		10	TDG 104 Rev 03	As per standard		
8	925164690000	STUB OD 250 ID 120 L = 200 SA182F22CL3		10	TDG 104 Rev 03	As per standard		
9	925166090000	HOL.FORG OD224/ID103 L=200SA182F22CL3		40	TDG 104 Rev 03	As per standard		
10	925166220000	HOL.FORG OD140/ID60 L=90SA182F22CL3		50	TDG 104 Rev 03	As per standard		
11	925166770000	ERV stub OD223 SA182F22CL3		20	TDG 104 Rev 03	4-80-999-93227-R00		
12	925166780000	Safety valve stub OD223 SA 182 F22CL3		100	TDG 104 Rev 03	4-80-999-93228-R00		
13	925166790000	Safety valve stub OD223 SA105		4	TDG 104 Rev 03	4-80-999-93229-R00		
14	925166800000	Safety valve stub OD220/203.2 SA105		50	TDG 104 Rev 03	4-80-999-93230-R00		
15	925166840000	Matchingpce OD300/ID139L=621 SA182F22CL3		10	TDG 104 Rev 03	4-80-999-93237-R01		
16	925166850000	MatchingpceOD310/ID147L=690SA182F22CL3		20	TDG 104 Rev 03	4-80-999-93238-R00		
17	925166880000	STUB 114.3X6.02 L=168 (OD 150 ) SA105		20	TDG 104 Rev 03	4-80-999-93242-R02		
18	925166890000	STUB141.3X6.02L=140(OD190)SA182 F22CL3		20	TDG 104 Rev 03	4-80-999-93244-R00		
19	925166910000	STUB 168.3 X7.11 L=168 ( OD205 ) SA105		20	TDG 104 Rev 03	4-80-999-93246-R00		
20	925179130000	BWCONRED813X50/660X36L=500 SA182F22CL3		4	TDG 104 Rev 03	4-80-311-60830-R00		
21	925179140000	BWCONRED813X60/660X36L=500 SA182F22CL3		4	TDG 104 Rev 03	4-80-311-60831-R00		
22	925179150000	MAT PIECE OD864X35/OD864X27 L=500 SA105		3	TDG 104 Rev 03	4-80-320-60917-R01		
23	925179410000	BW RED OD 508X64/OD368X48-SA105		9	TDG 104 Rev 03	4-80-423-62609-R01		
24	925271320004	MPCE645X31.5/355.6X32L=600 SA182F22CL3		8	TDG 104 Rev 03	4-80-321-60835-R00		
25	925275310000	BWCONREDOD645X31.5/508X28 SA182F22CL3	*	6	TDG 104 Rev 03	As per standard		
26	925275320000	BWCONREDOD645X31.5/355.6X32 SA182F22CL3	*	6	TDG 104 Rev 03	As per standard		
27	925279260000	MPCE711.2X40/ID590.4MAXX35MI SA182F22CL3		2	TDG 104 Rev 03	4-80-310-60827-R00		
28	925279270000	MPCEID800MXX55MN/OD711.2X40 SA182F22CL3		2	TDG 104 Rev 03	4-80-310-60828-R00		
29	925279290000	MPCEOD645X31.5/OD508X25L=500 SA182F22CL3		4	TDG 104 Rev 03	4-80-321-60836-R00		
<b>Grand Total</b>				<b>539</b>				

NOTE: \* is an indication that the raw materials and other services for the corresponding items shall NOT be sourced from CHINA.

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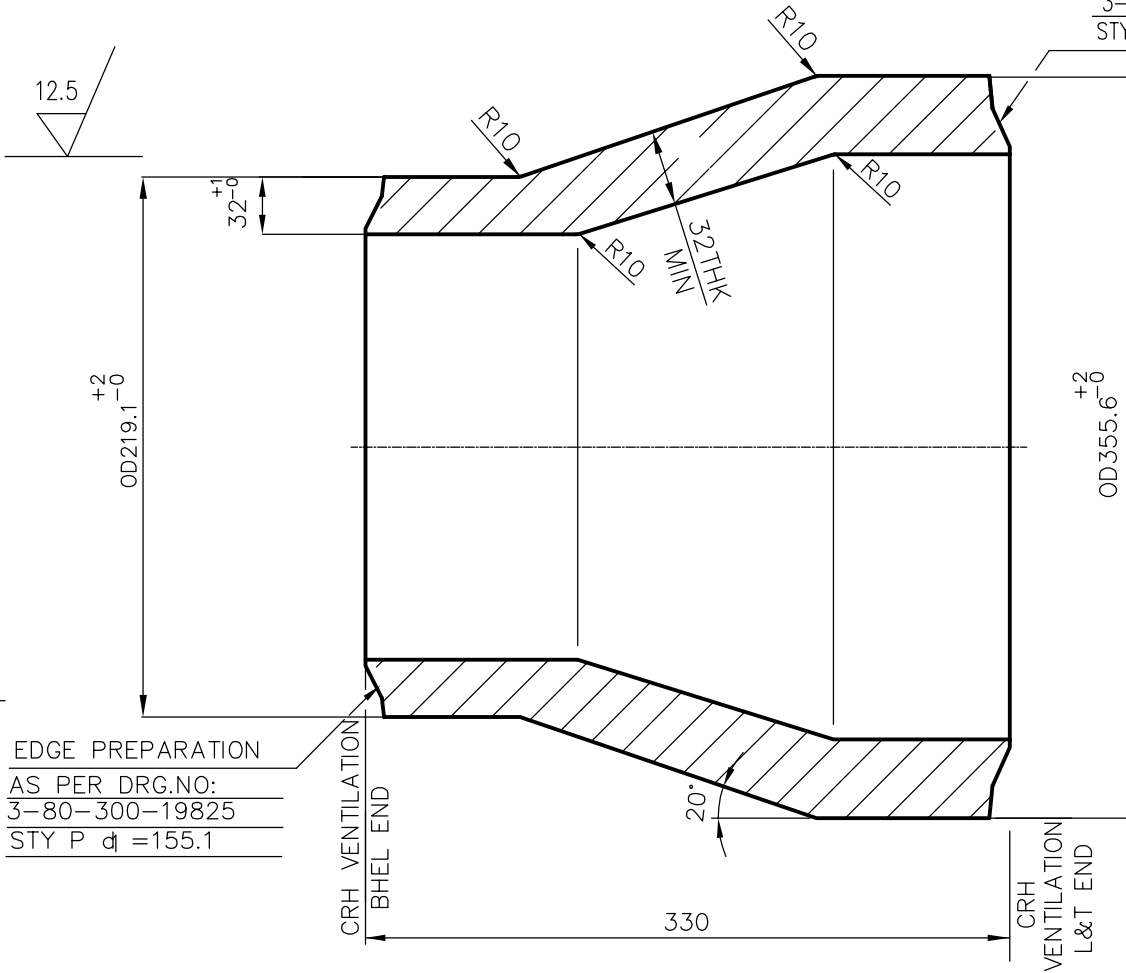
REV	DATE	ALTERED
01		APPROVED

**NOTES**


ALL DIMENSIONS ARE IN MILLIMETRES

- 1) DESIGN PRESSURE : 70.6 Kg/Cm<sup>2</sup> (g)
- 2) DESIGN TEMPERATURE : 475 °C
- 3) FOLLOW TDC No. : TDG-104 (LATEST REVISION)


EDGE PREPARATION  
AS PER DRG.NO:  
3-80-300-19825  
STY P d<sub>1</sub> = 321.4



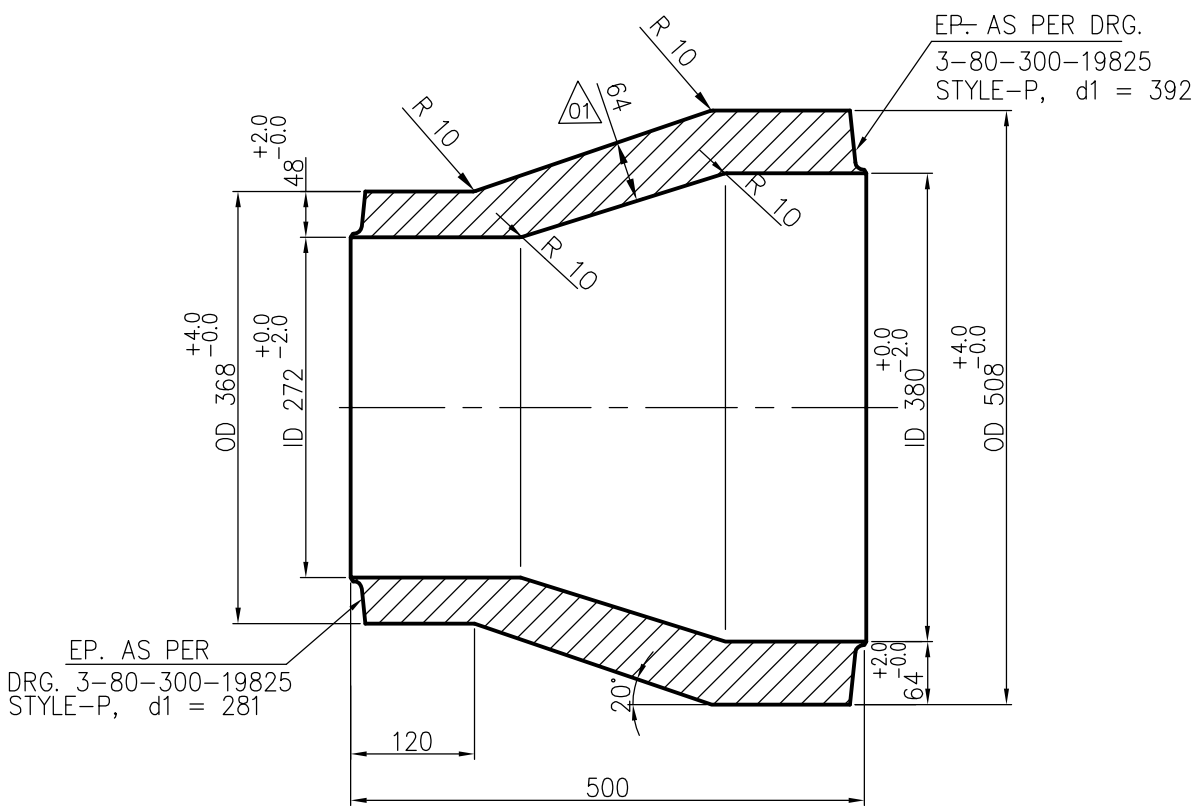
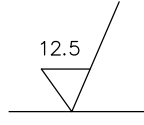
	MATCHING PIECE L=330 OD355.6X32/OD219.1X32	92 117 666 0000	A	51 000
VAR NO.	DESCRIPTION	MATL. CODE	UNIT	UNIT.WT.(Kg)
		MATL. SPECN.	DI	QTY.

		<b>BHARAT HEAVY ELECTRICALS LIMITED</b> PIPING CENTRE CHENNAI 600 017		DRN	KONDAPA	SIGN	DATE	NO. OF VAR
DEPT		GRADE OF UNTO L DIM		CHD	KONDAPA		26.09.11	
CODE		C / M / F		APPD	KVRAMANI		26.09.11	
TITLE		SCALE		BHEL PO REF.NO:			ITEM NO.	NO. OF ITEMS
		N.T.S		WEIGHT (KG)				
				51.000				
				DRAWING NO.			REV	
				4-80-320-73823			00	

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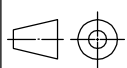
REV	DATE	ALTERED	R.SANTHOSH
01	09.11.09	APPROVED	M.MANO
DIM 71THK CORRECTED TO 64 THK.			
REV ARE INDICATED AS 			

ALL DIMENSIONS ARE IN MILLIMETRES



MACHINED REDUCER L=500 OD 508x64/OD 368x48	92 517 941 0000	A	290	000
	SA 105			
DESCRIPTION	MATL. CODE	A	UNIT.WT.(Kg)	
	MATL. SPECN.	C	QTY.	

**STANDARD**

		<b>BHARAT HEAVY ELECTRICALS LIMITED</b> PIPING CENTRE CHENNAI- 600 017		DRN	NAME	SIGN	DATE	NO.OF VAR
				CHD	T.N.ELANGOVAN		21.07.06	
				APPD	A.VELAYUTHAM		21.07.06	
DEPT	GRADE OF UNTOL.DIM		SCALE	WEIGHT (KG).	REF. TO ASSY./OLD DRG.		ITEM NO.	NO. OF ITEMS
CODE	C / M / F		N.T.S	290.000				
TITLE				CARD CODE	DRAWING NO.			REV
<b>MACHINED REDUCER</b> <b>(OD 508 x 64/OD 368 x 48)</b>				U 01	<b>4-80-423-62609</b>			<b>01</b>

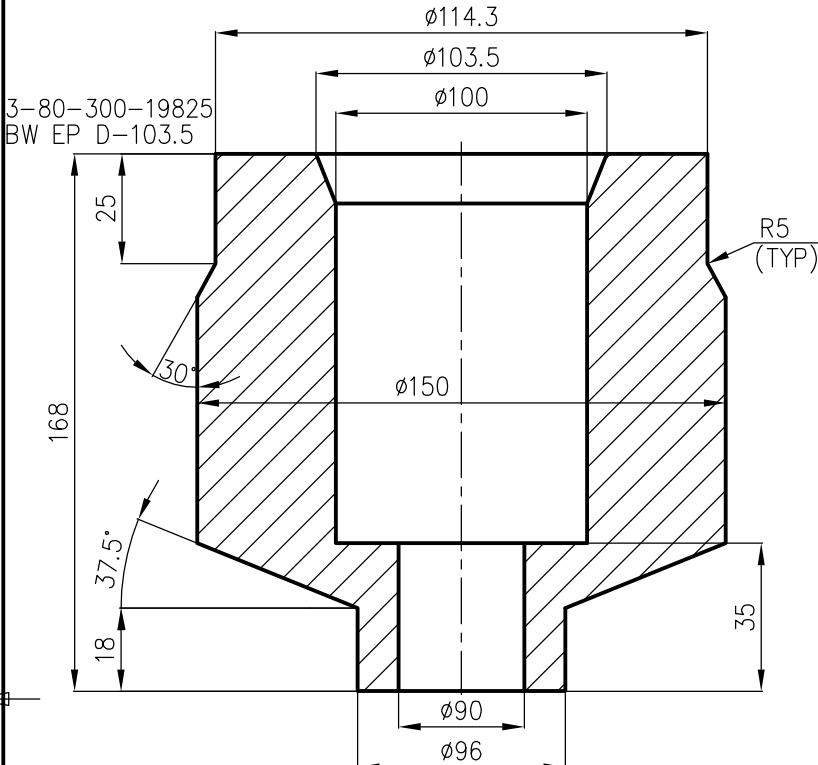
ALL DIMENSIONS ARE IN MILLIMETRES

REV 01	DATE 14.12.11	ALTERED M.R.K APPROVED G.V.R	REV 02	DATE 20.12.11	ALTERED M.R.K APPROVED C.K.N
NOTE 01 ADDED.			STUB OD CHANGED FROM "ø160" TO "ø150"		

DESIGN PRESSURE AT 370°C : 50kg/sq.cm(g)

12.5

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NOTE:  
01. THE COMPONENT DIMENSIONS SHOWN ARE REQUIRED FOR STUB 114.3X6.02 L168 OD150 SA105

VAR NO.	DESCRIPTION	STD	92.516.688.0000 SA105	A	UNIT	UNIT.WT.(Kg)
			MATL. CODE	A	DI	QTY.
			MATL. SPECN.	C		

**STANDARD**



BHARAT HEAVY ELECTRICALS LIMITED  
PIPING CENTRE  
CHENNAI 600 017

DRN	NAME R.ANANTH	SIGN	DATE 31.12.09	NO.OF VAR
CHD	R.ANANTH		31.12.09	
APPD	M.N.VASUDEVAN		31.12.09	

DEPT CODE	GRADE OF UNTOL.DIM C / M / F	SCALE N.T.S	WEIGHT (KG) 13.000	REF. TO ASSY./OLD DRG.	ITEM NO.	NO. OF ITEMS
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TITLE <b>STUB 114.3x6.02 L168 OD150 SA105</b>	CARD CODE U 01	DRAWING NO. <b>4-80-999-93242</b>	REV <b>02</b>
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### 1.0 CODES

Materials shall meet Indian Boiler Regulations, (IBR) in addition to the latest Version of SA105 & SA182 as on date specified in the Purchase Order (PO).

### 2.0 RAW MATERIAL

(a) The raw material used shall meet the respective specification and the test certificate shall be furnished.

(b) Steel for SA 182 F11, F12 & F22 if indigenously procured, to be procured from following manufacturers i) Alloy Steel Plant, Durgapur, ii) Tata Iron & Steel company, Jamshedpur & iii) Mahindra Ugin Steel Company, Mumbai, who are approved by IBR for creep resistant steels.

(c) Carbon content of Carbon steel fittings (SA 105) shall be restricted to 0.25% max

### 3.0 PROCESS

(a) Process of manufacture shall conform to applicable standards.

(b) Unless otherwise specified in the P.O, SA182 F11/12 fittings shall be supplied as per class 2 and SA182 F22 shall be of Class 3 only.

### 4.0 HEAT TREATMENT

4.1 All fittings shall be heat treated as below:

SA 105	- Normalised
SA182 F11/ F12/ F22	- Normalised & Tempered

4.2 Fittings conforming to SA182 F91 shall be normalised at 1040 to 1070 deg C (for wall thickness larger than 75 mm, accelerated cooling may be done to obtain a fully martensitic structure) and tempered at  $760 \pm 10$  deg C

### 5.0 TESTING

(a) Product analysis shall be carried out on One piece / Heat / HT lot / Size.

(b) Corrosion test (IGC) shall be carried out on one piece / Heat / HT lot / Size for SS fittings.

(c) All CS & AS items shall be tested by MPI as per ASTM E-709 & SS items by LPI as per E 165.

(d) Tension test shall be carried out on one Test piece for each specification, heat, heat treatment lot and size.

(e) Bend test for CS (SA 105) : One sample of 19 mm thick and 25mm width to be bent 180 deg around mandrel of radius 6.35mm.

(f) Bend test for AS (SA182): One Sample of 25.4 mm width and thickness = t to be bent 180 deg around mandrel of radius = 1.5 t. Test on representative sample is also acceptable.

S. Jayakumar, Engg

G.Panneer Selvam, QA

Approved by

K. Vedaprasad, QC

K. Ganeshan, MPL



- (g) Dimensions shall be as per Purchase Order.
- (h) **Metallography:-** Metallography shall be carried out on one per heat, per size, per heat treatment lot of WP91 / F91 fittings. Acceptance norms - The Material shall be free from any micro fissures. Microstructure shall show tempered martensite and also to be examined for any grain growth. Photomicrograph with 500x (Min) magnification along with Metallography report to be provided. The actual magnification shall be indicated.
- (i) Hardness test shall be carried out on all items of F91, and 10% on other material grades.
- (j) All items shall be ultrasonically tested as per SA388 and acceptance norms shall be as per 3.3.4 of ASME Sec VIII Div .2

## 6.0 POSITIVE MATERIAL IDENTIFICATION ( PMI ) FOR ALLOY STEEL FITTINGS.

Each alloy steel fitting shall be checked for the correctness of the material during manufacturing and final inspection using X-ray fluorescence principle or spark emission spectrography.

## 7.0 WORK MAN SHIP, FINISH AND REPAIR

All items shall have smooth, workman like finish, and to be free from scale & defects like laps, seams, folds, cracks, etc. Surface defects can be removed by mechanical means and defective areas smoothly dressed up with the adjacent surface. Minimum dimension after repair shall meet drawing / Specification. Repairs by fusion welding are prohibited.

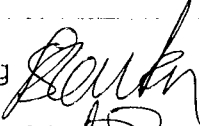
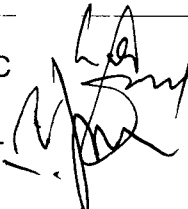


## 8.0 PAINTING , COLOUR CODING, MARKING, PACKING & END PROTECTION

- 8.1 **PAINTING :** All fittings except SS to be applied with resin type rust preventive coating with visibility to punched and 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.
- 8.2 **COLOUR CODING :** All fittings shall be colour coded circumferentially at ends as given below

SA105	=	Blue
SA182 F11	=	Green & White
SA182 F12	=	Black & Red
SA182 F22	=	Blue & Red
SA182 F91	=	Brown & Red
SA182 F316	=	Black & Blue

## 8.3 MARKING :

- 8.3.1 The fittings dispatched to **BHEL Stores** shall be punched / etched with Material code, Heat number, material specification, maker's emblem, Inspectors seal and Statutory authorities seal (as applicable) .

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G.Panneer Selvam, QA			K. Ganeshan, MPL	



In addition, the above details along with size shall be paint stenciled on the fittings.

8.3.2 The fittings dispatched directly to project site as **DTS** shall be punched and paint stenciled with DU code (14 digit work order du detail) as given by purchase in addition to marking done as per para 8.3.1.

8.4 **PACKING AND END PROTECTION** : Machined ends of the fittings shall be well protected using end caps and fittings shall be suitably packed in box / crate to avoid transit & other damages.

#### 9.0 INSPECTION & CERTIFICATION :-

All items 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 items 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(if any)
  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. Ladle and product Analysis of Raw Material.
  - \*10. Product analysis report.
  - \*11. Heat Treatment Chart.
  - \*12. NDE report. (VISUAL.MPI, LPI, UT)
  - \*13. Tensile Test report
  - \*14. Bend Test report.
  - \*15. Hardness Test report
  - \*16. Intergranular corrosion test report for SS
  17. Metallography Report along with photomicrograph with 500x ( min ) magnification.
  - \*18. Dimensional conformance.
  - \*19. Starting material details.
  - \*20. Guarantee of HTP shall be given in the test certificate as follows if hydro test is not carried out :- "Forgings are capable of with standing without failure, breakage 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.

#### 10.0 Records of Revisions:-

Revision 02 : Material specification SA 182 F316 added.

Revision 03 : a) Para 4.0, 6.0 included.

b) Para 5.0 (b),(c),(h),(j), 8.0 and 9.0 (17) are revised.

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