



1.0 SCOPE: -

The fittings shall meet Indian Boiler Regulations (IBR) except SS and Duplex SS (UNS32205) specifications unless otherwise specified, and the following requirements in addition to the standards specified in the Purchase Order (PO).

2.0 RAW MATERIALS: -

- All fittings shall be of seamless construction unless otherwise specified in the purchase order. Pipes used for manufacturing of seamless fittings shall be seamless pipes or forgings only.
- The raw material used for fittings shall meet the respective specification. The test certificate shall be furnished with Traceability.
- Raw material Steel for IBR items to be inspected at Mill & test certificate countersigned by IBR Authorized Inspecting Authority, if the mill is not approved under IBR as well-known steel maker.
- For Gr-92 items : Si : 0.10-0.50% ; Ni : 0.30max and Cu : 0.25 max. (both Ladle & Product analysis)

3.0 MANUFACTURING & TESTING REQUIREMENTS:

3.1 MANUFACTURING PROCESS :

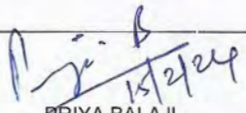
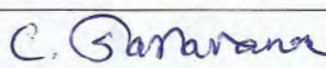
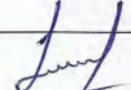
(i) Seamless Fittings:-

- A) Tees & Reducers :** Upto 80mm thickness : Formed Type.
Above 80mm thickness Formed or Forged type.
- B) Elbows :** Formed type for all thickness

(ii) Welded Fittings:- Supplied only if indicated in P.O and shall be of **Two-Half construction**.

3.2 Machined Fittings (Max size permitted 4”- directly from bar) – Reducers, Couplings & End Caps : Fittings machined from Castings are prohibited.

Starting material	Heat treatment	CS – Normalised ; AS – Normalised & Tempered SS & Duplex SS (UNS32205) – Solution Annealed
	NDE – UT	To be done after Heat treatment. For size above 40mm – to be done as per ASTM A 388 Acceptance to - ASME Sec.VIII Div.2 Cl.3.3.4. Actual measured notch depth to be specified in Test Certificate.
Finished fitting (after machining)	Heat treatment	Not required
	NDE (for all sizes)	• MT (100%) - Procedure - As per ASTM E709. No linear indications are acceptable (Linear Indication : Length $\geq$ 3XWidth) For WP91 & WP92 Wet MPI shall be done • LPI – SS & Duplex SS (UNS32205) : Shall be done as per ASTM E165. No linear indications are acceptable.
	Hardness	Base material Hardness for. WPB, WPC, WP11, WP12, WP22 – 197 HBW max. WP91 - 190-250 HBW – 100% to be checked WP92 - 196-250 HBW – 100% to be checked Duplex SS (UNS32205) – 300BHN max
	Dimension	ASME B16.9 or as per Engineering Drawing indicated in Purchase Order.
	Bend Test (for IBR items)	Specimen: 19mm. Thickness (t) x 25.4mm width - cold bent 180 deg. over thin section without fracture, mandrel radius: CS : $\leq$ 6.35 mm. AS, SS : $\leq$ 1.5 times specimen thick.

 J.NANTHINI MGR/ QA	 PRIYA BALAJI SDGM / MM	 C. SARAVANAN AGM / ENGINEERING	 S.JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by



3.3 Seamless Formed Fittings – Ells, Tees, Reducers, Dished end (End cover / Cap)

Starting material:	Heat treatment shall be as per starting material specification	CS – Normalised AS – Normalised & Tempered SS & Duplex SS (UNS32205) – Solution Annealed					
1)Tube & Pipe	NDE – UT	UT shall be done as per - ASTM E 213 with longitudinal notch of 5% wall thickness with max.1.5mm and min. 0.3mm. Actual measured notch depth to be specified in Test Certificate.					
2) Forged blank (For End covers)	NDE – UT	For size above 40mm ; UT shall be done as per - ASTM A 388 In acceptance to - ASME Sec.VIII Div.2 Cl.3.3.4. Actual measured notch depth to be specified in Test Certificate.					
3) Plate	NDE – UT	For size above 10mm SA 578, Acceptance Level – B. Actual measured notch depth to be specified in Test Certificate.					
Finished fitting (cold/hot forming)	Heat treatment after forming	Shall be done as per SA234 and follow below table for heat treatment values.					
		Material	Heat Treatment Temp.°C		Soaking time, hr/in		
			Normalising	Tempering	Normalising	Tempering	
		CS- WPB & WPC	870-900	-	1/2	-	
		AS-WP11 & WP12	920-960	640-670	1/2	1	
		AS-WP22	920-960	680-710	1/2	1	
		AS- WP91	1040-1080	760-780	1/2	1	
	AS- WP92	1040-1080	760-780	1/2	1		
			Stainless Steel - All grades & Duplex SS (UNS32205): - Solution Annealed: 1050-1100 Deg C Soaking time : ½ hr per inch with minimum 15 minutes Note: Normalising shall be done for a minimum time of 30 min while tempering to be done for a minimum time of 60min for all materials except SS & Duplex SS (UNS32205).				
	NDE (for all sizes) – Except for Plate formed Dished end	• MT (100%) - Shall be as per - ASTM E709 No linear indications are acceptable. For WP91 & WP92 Wet MPI shall be done. • LPI – SS & Duplex SS (UNS32205): Shall be done as per ASTM E165. No linear indications are acceptable.					
NDE–for Plate formed Dished end	For Plate Formed Dished end – 100% MT as per - ASTM E709 on both inner and outer surfaces of Knuckle radius and weld ends. No linear indications are acceptable. UT shall be as per A578 Level-B. Actual measured notch depth to be specified in Test Certificate.						
NDE – UT For OD >= 219mm or W.T >= 6mm	If made from Pipe & Tube – Shall be done as per - ASTM E 213 with longitudinal notch of 5% wall thickness with max.1.5mm and min. 0.3mm. Actual measured notch depth to be specified in Test Certificate. If made from Forging - Shall be as per - ASTM A 388 In acceptance to - ASME Sec.VIII Div.2 Cl.3.3.4. Actual measured notch depth to be specified in Test Certificate.						
Hardness	Base material Hardness for WPB, WPC, WP11, WP12, WP22 – 197 HBW max. WP91 - 191-250 HBW – 100% to be checked WP92 - 196-250 HBW – 100% to be checked Duplex SS (UNS32205) – 300HBW max						
Dimension	ASME B16.9, As per Engineering drawing indicated in Purchase Order. The ends of reducers shall have a straight portion of Minimum 13mm.						
Bend Test for IBR items (if starting material is forged blank)	Specimen: 25.4 mm x 19 mm thick - cold bent 180 deg. over thin section without fracture, internal radius of bend: CS :<=6.35 mm. AS, SS: <=1.5 times specimen thick.						
J. NANTHINI MGR/ QA		PRIYA BALAJI SDGM / MM		C. SARAVANAN AGM / ENGINEERING		S JEGAN SR.MGR / QUALITY	
Prepared by		Reviewed by		Approved by			



3.4 Forged Fittings –Tees, Reducers, Couplings, Flanges & Dished End (End cover/Cap)

Shall be forged to the shape with a minimum forge reduction ratio of 1:4. Fitting shall not be machined from a forged block.

Starting material: Rolled or Forged Bars, Blooms, Billets (Killed steel)	Heat treatment shall be as per starting material specification	CS – Normalised AS – Normalised & Tempered SS & Duplex SS (UNS32205) – Solution Annealed				
	NDE – UT	To be done for diameter or thickness above 40mm Procedure - As per ASTM A388 In acceptance to - ASME Sec.VIII Div.2 Cl.3.3.4. Actual measured notch depth to be specified in Test Certificate.				
Finished fitting	Heat treatment After forging (cold/hot forging)	Shall be done as per SA234 and follow below table for heat treatment values.				
		Material	Heat Treatment Temp, °C		Soaking time, hr/in	
			Normalizing	Tempering	Normalizing	Tempering
		CS- WPB & WPC	870-900	-	1/2	-
		AS-WP11 & WP12	920-960	640-670	1/2	1
		AS-WP22	920-960	680-710	1/2	1
		AS- WP91	1040-1080	760-780	1/2	1
		AS- WP92	1040-1080	760-780	1/2	1
		Stainless Steel - All grades & Duplex SS (UNS32205): - Solution Annealed: 1050-1100 Deg C Soaking time : ½ hr per inch with minimum 15 minutes Note: Normalising shall be done for a minimum time of 30 min while tempering to be done for a minimum time of 60min for all materials except SS & Duplex SS (UNS32205).				
	NDE – UT For OD >= 219mm or W.T >= 6mm	UT shall be done as per - ASTM A388 In Acceptance to - ASME Sec.VIII Div.2 Cl.3.3.4. Actual measured notch depth to be specified in Test Certificate.				
NDE (for all sizes)	MT- (100%) Shall be done as per ASTM E709. No linear indications are acceptable. For WP91 & WP92 Wet MPI shall be done. LPI – SS & Duplex SS (UNS32205): Shall be done as per ASTM E165. No linear indications are acceptable.					
Hardness	WPB, WPC, WP11, WP12, WP22 – 197 BHN max. WP91 - 191-250 BHN – 100% to be checked WP92 - 196-250 HBW – 100% to be checked Duplex SS (UNS32205) – 300BHN max					
Dimension	ASME B16.9 or ASME B16.5 or as per Engineering drawing indicated in Purchase order.					
Bend Test (for IBR items)	Specimen: 19mm. Thickness (t) x 25.4mm width - cold bent 180 deg. over thin section without fracture, mandrel radius: CS : <=6.35 mm. AS, SS : <=1.5 times specimen thick.					

 J.NANTHINI MGR/ QA	 P. J. BALAJI SDGM / MM	 C. SARAVANAN AGM / ENGINEERING	 S.JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by



3.5 Welded Fittings– Ells, Tees, Reducers (Two-Half construction):

Pipe made from plate and long seam welded shall not be used as a starting material.

Starting material: Plate	NDE – UT	For thickness above 10mm SA 578, Acceptance Level – B.				
Finished fitting	Heat Treatment After forming	Shall be done as per SA234 and follow below table for heat treatment values.				
		Material	Heat Treatment Temp, °C		Soaking time, hr/in	
			Normalizing	Tempering	Normalizing	Tempering
		CS- WPBW & WPCW	870-900	-	1/2	-
		AS-WP11W & WP12W	920-960	640-670	1/2	1
		AS-WP22W	920-960	680-710	1/2	1
		AS- WP91W	1040-1080	760-780	1/2	1
	AS- WP92W	1040-1080	760-780	1/2	1	
	Stainless Steel - All grades & Duplex SS (UNS32205): - Solution Annealed: 1050-1100 Deg C Soaking time : ½ hr per inch with minimum 15 minutes					
	Post Weld Heat Treatment (PWHT)	PWHT shall be done as indicated below.				
Material		Heat Treatment Temp, °C		Soaking time		
CS- WPB-W & WPC-W If weld thk>19mm		595-635		2.5min per mm of weld thk; Minimum 30minutes.		
AS-WP11-W&WP12-W		650-680				
AS-WP22-W		690-710		2.5min per mm of weld thk; Minimum 60minutes.		
AS- WP91-W		760-780				
AS- WP92-W	760-780					
NDE (for all sizes)	• MT (100%)- Procedure - As per ASTM E709. No linear indications are acceptable For WP91 & WP92 Wet MPI shall be done • LPI – SS & Duplex SS (UNS32205) : Shall be done as per ASTM E165. No linear indications are acceptable.					
NDE – for Weld	• RT (100%)- Acceptance norm shall be UW 51 of ASME Sec VIII DIV-1.					
Hardness	Base material Hardness for WPB, WPC, WP11, WP12, WP22 – 197 BHN max. WP91 - 191-250 BHN – 100% to be checked WP92 - 196-250 HBW – 100% to be checked Duplex SS (UNS32205) – 300BHN max Weld Hardness WP91 - 300 BHN max. – 100% to be checked WP92 - 300 BHN max. – 100% to be checked					
Dimension	ASME B16.9 or as per Engineering drawing indicated in Purchase order.					
Bend Test (for IBR items)	Specimen: 19mm. Thickness (t) x 25.4mm width - cold bent 180 deg. over thin section without fracture, mandrel radius: CS : <=6.35 mm. AS, SS : <=1.5 times specimen thick.					

4.0 GENERAL REQUIREMENTS:

- Carbon < or = 0.25% for WPB (all thickness) and WPC (thickness < or = 20mm)
- Carbon < or = 0.30% for WPC (thickness > 20mm)
- If UT not done on the starting material, the same shall be done by the fitting manufactures before forming / fabrication.

 J. NANTHINI MGR/ QA	 PRIYA BALAJI SDGM / MM	 C. SARAVANAN AGM / ENGINEERING	 S. JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by



- d) **Chemical and Mechanical Testing** – Test samples shall be tested in the Heat treatment of fitting delivered condition.
- i) Product analysis – one / heat / size.
 - ii) Tension test – one / heat / heat treatment lot / size
 - iii) Hardness test – 100% for Gr91 and Gr92. 10% for others.
- e) **Photomicrograph test for WP91 & WP92** :- Photomicrograph test shall be carried out on one per heat, per size. 3 replicas in one fitting. 1 replica for the size Nb 80 & below. 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 and delta ferrite (to be maintained within 3% for Gr92 when measured as per VD TUV 1272). Photomicrograph with 500x (Min) magnification along with Photomicrograph report to be provided. The actual magnification shall be indicated.
- f) In case of welded fittings, WPS, PQR & welder qualification shall be approved by BHEL, prior to start of welding.
- g) Unless otherwise specified in the P.O SA 234 WP 11/12/22 fittings shall be supplied as per class1.
- h) **Stainless Steel (SS) & Duplex SS (UNS32205)** : Finished fittings shall be checked for radioactive contamination and reported. Survey meter shall be used to measure at 5cm near the surface. Acceptance limits: Shall be less than 0.1 milli Rontgen (MR) per hr or 1 micro Sievert per hr.

5.0 POSITIVE MATERIAL IDENTIFICATION (PMI) FOR ALLOY STEEL (AS), STAINLESS STEEL (SS) AND DUPLEX SS (UNS32205) FITTINGS.

Each AS, SS and Duplex SS (UNS32205) fitting shall be checked for the correctness of the material during manufacturing and final inspection using X-ray fluorescence principle or spark emission spectrography.

6.0 WORKMANSHIP, 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.

Flatness on curved surfaces of fittings shall be limited to 6% of nominal OD.

Thickness: Outer Diameter & Transition: Variation shall be merged smooth to min 1:4 taper.

7.0 PAINTING, COLOUR CODING & MARKING

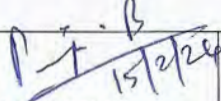
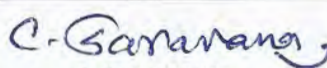
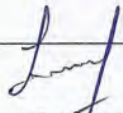
7.1 **PAINTING:** All fittings (except stainless steel and galvanized) shall be **painted** on the external surface as given below (unless otherwise specified): -

- a) **Surface preparation:** Blast cleaning to SSPC SP-10 (SA 2½) with surface profile 35-50 microns.
- b) **Primer coat:** One coat of 60 microns of In-Organic Ethyl Zinc Silicate primer.
- c) **Finish coat:** Two coats of 20 microns each of Heat Resistance Aluminium paint to IS13183 Gr-1.
- d) **Total DFT:** 100 microns minimum.
- e) **Shade:** Aluminium -- for all fittings.

The internal surface shall be protected with rust preventive coating or rust inhibitor. Edge preparations for Site ends shall be protected with weldable primer.

Stainless steel and Duplex SS (UNS32205) fittings need not be painted. Stainless steel and Duplex SS (UNS32205) fittings to be surface treated (Pickling & Passivation) as per ASTM A380.

7.2 **COLOUR CODING:** All fittings shall be colour coded circumferentially at all ends as given below:

 J.NANTHINI MGR/ QA	 PRIYA BALAJI SDGM / MM	 C. SARAVANAN AGM / ENGINEERING	 S.JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by



Material Specification		Colour Code
SA 234	WPB	Red
	WPC	Blue
	WP11	Green & White
	WP12	Black & Red
	WP22	Blue & Red
	WP91	Brown & Red
	WP92	Brown & Blue
SA 403	WP304	Blue & Yellow
	WP304L	Blue, Red & Yellow
	WP304H	Black, Blue & Yellow
	WP316	Black & Green
	WP316L	Blue, Brown & Yellow
	WP321	Blue & Brown
	WP347	Yellow & Black
SA815 (Duplex Stainless Steel)		Red, White & Green

7.3 MARKING (In English only):

7.3.1 For fittings of size above 2” (50mm) :

All the fittings shall be necessarily hard punched / etched and paint stencilled with the details: Material code, Heat number, material specification, size, maker's emblem, Inspectors seal, Running Serial number for the P.O. quantity and Statutory authorities seal as applicable, if fittings are sent to BHEL Stores. (Letter size shall be 6mm minimum and bordered with white paint for easy identification)

7.3.2 For fittings of size 2” (50mm) & below :

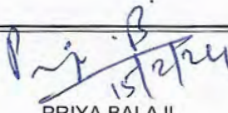
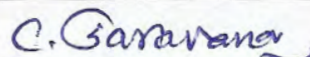
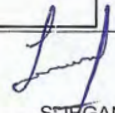
- Engraving on each fitting with minimum details like melt, branch no and Paint stencilling of all above details. Where paint stencil is not possible, permanent metal marker shall be used. (Normal white board permanent marker shall not be used).
- Fittings of size up to 2” (50mm) shall be tied together of appropriate numbers and the above details as indicated in Para 7.3.1 shall be engraved in a separate metal/plastic tag and securely tied to it.

7.3.3 For fittings of thickness less than 6mm :

If the thickness of the fitting is less than 6 mm, punching is not permitted. The above details as indicated in Para 7.3.1 shall be engraved and paint stencilled on each fitting. Where paint stencil is not possible, permanent metal marker shall be used. (Normal white board permanent marker shall not be used).

7.3.4 In case of fittings dispatched directly to project site as **DTS**, material code shall be replaced with DU code (14-digit work order DU detail) as given by Purchase during DTS advice. All other details shall be hard punched and paint stencilled as indicated in Para 7.3.1.

Sample format for Punching & Stencilling is given below.

Vendor code & Name	:	Makers Emblem	
Material code / DU details :		Insp. Authority Stamp	
Melt No.	:		
Material Specification	:		
Qty.	:		
Serial No	:	(Example : 1,2,3,.....& 25)	
Weight.	:		
 J. NANTHINI MGR/ QA	 PRIYA BALAJI SDGM / MM	 C. SARAVANAN AGM / ENGINEERING	 S. JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by



8.0 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 as per the Packaging procedure PC: PKG: 01 to avoid transit & other damages.

9.0 INSPECTION & CERTIFICATION (In English only):

9.1 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 III C & Form III-I for Dished Ends shall be submitted along with the Work Test Certificate countersigned by the above authorities and shall include the following (Three ink signed originals required).

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 (MTC shall contain size and spec details strictly as per PO)
6. Specification, Grade & Year of code.
7. Heat/Melt Number
8. Starting material details with traceability.
9. Steel making process
10. Ladle Analysis of Raw Material and product analysis of fitting.
11. *Supplementary Test (Product analysis, Tension test) results.
12. Tensile Test Report.
13. Painting Report as per format Doc no TDG102:003.
14. Photocopy of Marking details of one sample for one PO Serial No vetted by TPIA.
15. *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.

9.2 The following reports shall be **furnished separately** along with the IBR Forms & MTC indicated in para 9.1 above.

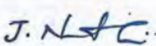
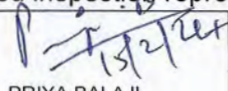
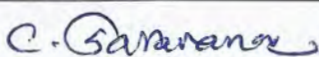
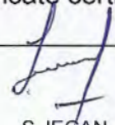
- i. NDE reports for MT, RT, UT (UT Reports in soft copy + hard copy). Actual measured UT-notch depth to be specified in Test Certificate.
- ii. Positive Material identification (PMI) report
- iii. Heat Treatment Chart.
- iv. Hardness Test report.
- v. Photomicrograph test report along with photomicrograph with minimum 500x magnifications.
- vi. Dimensional report (as built drawing with dimensions)
- vii. Thickness Measurement Report for Elbows & Tees as per Doc No : TDG102:001 & TDG102:002.

The above report numbers shall be indicated in the MTC for ready correlation. Vendor shall ensure correlation and traceability wrt documentation.

9.3 For CE marking items if indicated in P.O. the TCs with details specified above shall be submitted as per EN-10204 (Latest).

- i. For pressure parts test certificates of type 3.1 or 3.2 is acceptable.

Type 3.1 – Suppliers shall have ISO 9001-2008/2015 (with validity as applicable) certification certified by Notified Body recognized by European Community and test certificate certified by suppliers authorized inspection representative.

 J.NANTHINI MGR/ QA	 PRIYA BALAJI SDGM / MM	 C. SARAVANAN AGM / ENGINEERING	 S.JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by



Type 3.2 – Components inspected and test certificates certified by both the supplier's authorized inspection representative and Notified Body recognized by European Community.

ii. For non-pressure parts test certificates of type 2.2 is acceptable.

Type 2.2 – Suppliers test certificates certified by the supplier's authorized inspection representative with test results as required by this TDG.

10.0 AUDIT CHECKS AT BHEL :

BHEL reserves the right to carry out audit checks for Chemistry, HT condition, Mechanical test and NDT on fittings.

Supplies found defective during check at BHEL are liable for rejection.

11.0 RECORDS OF REVISION :

Rev 01 : a) Fully revised for better clarity.

b) Para 2.0 (e) added.

Rev 02 : a) Para 2.0 (c): UT acceptance norms revised from level A to B.

Rev 03 : a) Fully revised for better clarity.

b) Para 4.2, 6.0, 8.0 (11) added.

c) Para 2 (d), 4.1, 5 (d) are revised.

Rev 04 : a) Para 5.0 (g), 7.0 and 8.0 (17) are revised.

Rev 05 : a) New material specification SA 815 Duplex Stainless Steel included.

b) Para 4.1, 4.2, 5.0 (d), 7.1 & 7.2 are revised.

c) 5.0 (a), (b), (c), (e), (f), (g), 7.3.1 & 7.3.2 are modified for better clarity.

Rev 06 : a) Para 8.2 added.

b) Para 5.0(d), 5.0(g), 7.1, & 8.1 are revised.

c) Para 1.0 & 7.2 are modified.

Rev 07 : Para 8.2 - vii added.

Rev 08 : a) Title revised for better clarity

b) Para 1.0, 2.0(a), 5.0(c), 8.4, 9.1(8) & 9.2(vi) are revised.

c) From Para 3.0(f), 4.2, 5.0(d), (f), (g), 7.2 forging spec removed

d) Para 2.0(c), (f), 3.0(a), 7.0 & 10.0 added

e) Para 3.0(e) deleted

f) Document no. TDG102:002 Rev.00 added.

Rev 09 : Fully revised for better clarity

Rev 10 : (a) Title and Para 1.0 revised.

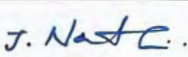
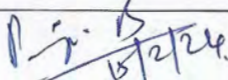
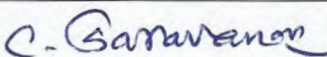
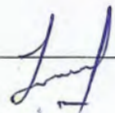
(b) Requirement of Gr92 fittings included, hence TDG 120 will become obsolete.

(b) CI 1.0 - Creep test requirement removed.

(c) CI 7.0 - Painting, Color coding & Marking modified for better clarity.

(d) CI 9.0 - Revised for improved documentation.

(e) Document no. TDG102:003 and TDG102:004 Rev.00 added.

 J. NANTHINI MGR/ QA	 PRIYA BALAJI SDGM / MM	 C. SARAVANAN AGM / ENGINEERING	 S. JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by



THICKNESS MEASUREMENT REPORT FOR ELBOW

Doc No: TDG102:001 Rev.00

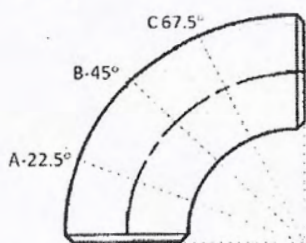
Date: 03.02.2014

PO Number:

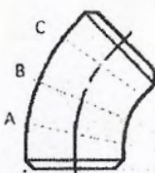
Work order/Du:

Heat no:

Size:



90° Elbow



Less than 90°

Measurement (Extrodus) points

Angle	A	B	C
90	22.50°	45.00°	67.50°
60	15.00°	30.00°	45.00°
45	11.25°	22.50°	33.75°
30	NA	15.00°	NA

Description of item :
Material Spec :
Material Code :

No	Wall thickness at ends		Wall Thickness at angle			Remarks
	End 1	End 2	A	B	C	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						

J. N. H. E. J. NANTHINI MGR/ QA	Priya Balaji 15/2/24 PRIYA BALAJI SDGM / MM	C. Saravanan C. SARAVANAN AGM / ENGINEERING	S. Jegan S.JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by



THICKNESS MEASUREMENT REPORT FOR TEE's

Doc No: TDG102:002 Rev.00

Date: 20.06.2015

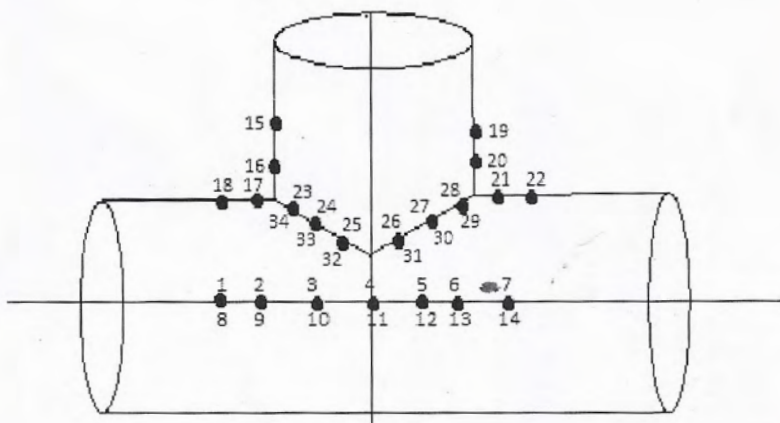
PO Number:

Description of Material:

Size:

Material Spec.

Work order/Du:



Location	Thickness (mm)	Location	Thickness (mm)	Location	Thickness (mm)
1		13		24	
2		14		25	
3		15		26	
4		16		27	
5		17		28	
6		18		29	
7		19		30	
8		20		31	
9		21		32	
10		22		33	
11		23		34	
12		24			

<i>J. N. E.</i> J. NANTHINI MGR/ QA	<i>Priya Balaji</i> PRIYA BALAJI SDGM / MM	<i>C. Saravanan</i> C. SARAVANAN AGM / ENGINEERING	<i>S. Jegan</i> S. JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by



PAINTING & MARKING REPORT

Doc No: TDG102:003 Rev.00

Date: 15.02.2024

Report No:

Date:

BHEL PO. NO & Date :
TDG No :
Applicable Painting Scheme :
Surface Preparation :
Primer Coat :
Primer paint Batch no & Expiry date :
Finish Coat & Shade :
Finish paint Batch no & Expiry date :
Internal surface coating (if applicable) :

PO. Sl.No	Description	Quantity	Total DFT Required	Total DFT Measured	Remarks

(Add Annexure, if no of PO Sl.no is more)

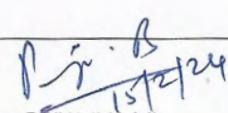
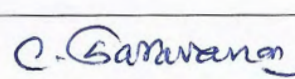
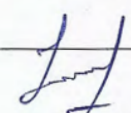
Color Code (marked Circumferentially at all ends) :

Marking : As per TDG & PO requirements.

It is hereby confirmed that the above mentioned components/items/equipment was/were painted as per the TDG & PO requirements as referred above and found acceptable.

Verified
(Vendor QC Sign & Seal)

Reviewed
(BHEL QC Sign & Seal)

 J.NANTHINI MGR/ QA	 PRIYA BALAJI SDGM / MM	 C. SARAVANAN AGM / ENGINEERING	 S.JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by



PRE DISPATCH INSPECTION REPORT

Doc No: TDG102:004 Rev.00

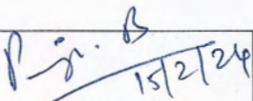
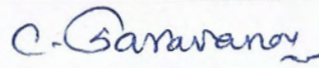
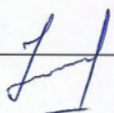
Date: 15.12.2024

S NO	PO NO & PO SI NO	MATERIAL CODE / WORK ORDER NO	ITEM DESCRIPTION	QUANTITY	WEIGHT (MT)

OBSERVATIONS : (Photos also to be enclosed)

PDI DONE BY

(BHEL/BHEL AIA Sign & Seal)

 J. NANTHINI MGR/ QA	 PRIYA BALAJI SDGM / MM	 C. SARAVANAN AGM / ENGINEERING	 S. JEGAN SR.MGR / QUALITY
Prepared by	Reviewed by		Approved by