



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

Piping Centre , 80, G. N. Chetty Road, CHENNAI – 600 017
Phone : 91 (044) 28161245, Fax 044 28161 341 e-mail: prs@bhelmpc.co.in

REF: ENQ NO:47

DT: 11.06.2010

Sub: Procurement of pipes with attachments.

Ref: Enquiry No:PC:4101000047 dt 11.06.2010

Please find the following tender documents for reference.

1. List of items and sample drawings
2. Tech. delivery condition TDG: 109 & TDG:102.

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.

New vendors may download vendor registration forms from BHEL web site www.bhel.com and relevant data for formal registration.

Dy Manager / Purchase
BHEL / Piping Centre
80,GN Road, T.Nagar
Chennai-600017
Ph: 044-28161245

Enquiry No:4101000047 dt 11.06.2010

Tender Due Date: 25.06.2010

Annexure A - List of items

Delivery required : 4 months from LOI/PO date

Enq Sl No	Material	Drawing no	Description	Total Qty Nos
1	925167050000	3-80-999-97785/00	PIPE WITH SV STUB CONN PIPE 323.9 X 31 -SA182 F91	30
2	925167060000	3-80-999-97786/00	PIPE WITH ERV STUB CONN PIPE 323.9 X 31 -SA182 F91	30

58776-666-08-3

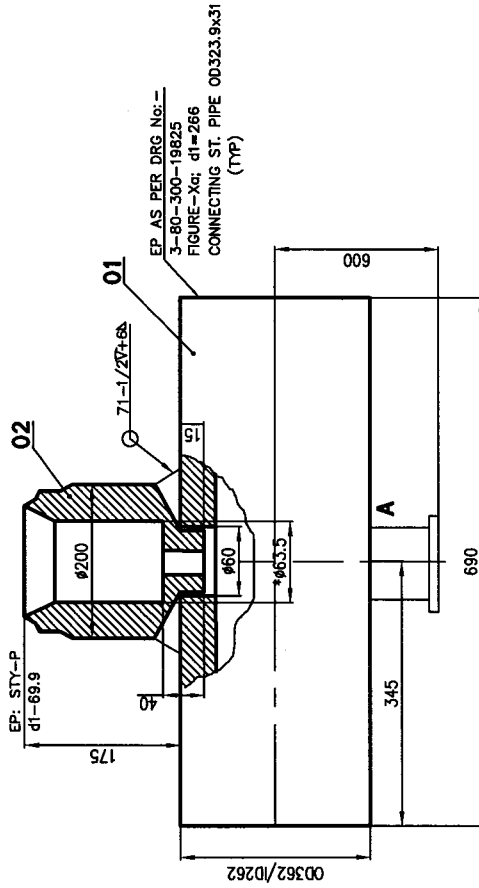
DRAWING No

NOTES :-

01. DESIGN PRESSURE : 170 Kg/sq.cm
02. DESIGN TEMPERATURE : 540° C
03. FOLLOW TDC No : TDC:109 Rev 00
*04. AFTER WELDING THE STUB BORE THROUGH ϕ 63.5
05. ELECTRODE TO BE USED

MATERIAL SPECN. (A)	ELECTRODE DATA(A)
MATERIAL SPECN. (A)	ROOT RUN
SA182F91	ER 90S B9 E 9015 B9
SA182F91	ER 90S B3 E 9018 B3
SA333P22	

06. OLD RAW MATERIAL CODE FOR ITEM NO:01 IS 92 084 120 0000
07. OLD RAW MATERIAL CODE FOR ITEM NO:02 IS 92 084 110 0000
08. FINISHED COMPONENT CODE IS 92 516 705 0000
09. THIS COMPONENT IS APPLICABLE FOR 250/270 MW UNITS



STANDARD

04	PLATE 320x320x16	3-80-999-97785	SA 387 Gr.22 CL2	C	12 861
03	SUPPORT PIPE L =431 OD273x36	3-80-999-97785	SA 335 P22	C	90 639
02	SAFETY VALVE STUB OD 152.4x41.25, L=190	4-80-999-93254/00	SA 182 F91	A	40 000
01	FORGING 00362/D262 L=690	3-80-999-97785	SA 182 F91	A	266 143
ITEM NO.	DESCRIPTION	DRAWING NO.	ITEM NO.	MATERIAL CODE	UNIT WT.
				MATERIAL SPEC.	QTY.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT



BHARAT HEAVY ELECTRICALS LTD.,
PIPING CENTRE,
CHENNAI 600 017

DRN	NAME	SIGN	DATE	NO OF
CHD	P.SURESH/SVRK		07.06.10	ITEMS
APPD	AP.MADHAVANKUTTY		07.06.10	
	S.JAYAKUMAR		07.06.10	

DEPT.	GRADE OF UN TOL DIM	SCALE	WEIGHT (Kg)	REF TO ASST / OLD DRG
CODE	C / M / F		409.643	

REV	DATE	ALTERED
01		APPROVED

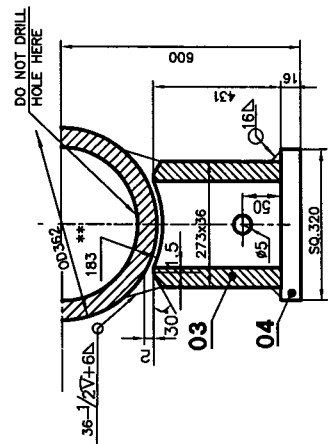
ITEM No.	REV
	00

CARD CODE	DRAWING No.	REV
U 01	3-80-999-97785	00

PIPE WITH SAFETY VALVE STUB
(CONNECTING PIPE OD 323.9x31)

DETAIL-A

** SUPPORT PIPE SHALL BE CUT TO SUIT THE OUTER SURFACE OF THE MAIN PIPE SUCH THAT A UNIFORM GAP OF 2mm IS MAINTAINED THROUGHOUT



CAUTION THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

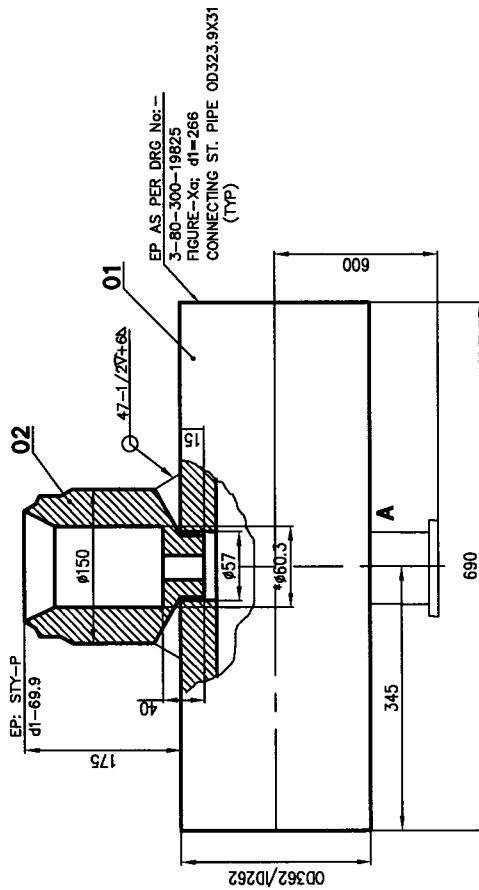
DRAFTING No

NOTES :-

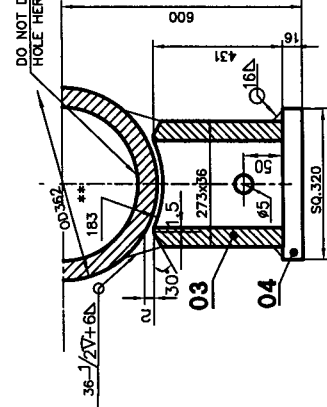
01. DESIGN PRESSURE : 170 Kg/sq.cm
02. DESIGN TEMPERATURE : 540° C
03. FOLLOW QP No : APPLICABLE QP
* 04. AFTER WELDING THE STUB BORE THROUGH #60.3
05. ELECTRODE TO BE USED ARE

MATERIAL SPECN. (A)	ELECTRODE DATA(A)
MATERIAL SPECN. (A)	ROOT RUN FURTHER RUN
SA182F91	ER90S89
SA182F91	E901589
SA182F91	ER90S83
SA335922	E901863

06. OLD RAW MATERIAL CODE FOR ITEM NO:01 IS 92 084 120 0000
07. OLD RAW MATERIAL CODE FOR ITEM NO:02 IS 92 084 093 0000
08. FINISHED COMPONENT CODE IS 92 516 706 0000
09. THIS COMPONENT IS APPLICABLE FOR 250/270 MW UNITS




**** SUPPORT PIPE SHALL BE CUT TO SUIT THE OUTER SURFACE OF THE MAIN PIPE SUCH THAT A UNIFORM GAP OF 2mm IS MAINTAINED THROUGHOUT**




DETAIL-A

04	PLATE 320x320X16	3-80-999-97786				C	12	861
03	SUPPORT PIPE L =431 00273x36	3-80-999-97786			SA 387 Gr.22 Cl2	C	90	639
02	ERV STUB 00139.7 x 34.9 THK L=190	4-80-999-93255/00			SA 335 P22	A	21	420
01	FORGING 00362/0262 L=690	3-80-999-97786			SA 182 F91	A	266	143
ITEM NO.	DESCRIPTION	DRAWING NO.	ITEM NO.	MATERIAL CODE	UNIT WT.	QTY		

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

		BHARAT HEAVY ELECTRICALS LTD., PIPING CENTRE, CHENNAI 600 017				DATE	NO OF
DEPT.	GRADE OF	SCALE	WEIGHT (kg.)	REF TO ASBY / OLD DRG	SIGN	DATE	ITEM
CODE	UN TOL DIM	C/M/F	391.063				
TITLE		PIPE WITH ERV STUB (CONNECTING PIPE OD 323 9±31)			DRAWING No.	REV	
					3-80-999-97786	00	

	Bharat Heavy Electricals Limited, Piping Centre, Chennai Technical Delivery Conditions for Pipe with Stubs, Branches and Attachments (Imported)	TDG:109 05.03.2010 Page 1 of 6
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1.0 GENERAL

Pipe with stubs, branches and attachments shall be manufactured as per BHEL drawing and shall meet Indian Boiler Regulations (IBR). The following requirements shall be taken care in addition to the latest version of relevant material specifications.

2.0 PIPES.

2.1 Material : SA 106, SA 335 P11, P12, P22, P91.

2.2 The pipes used shall meet the requirements indicated in Technical delivery condition ref. TDG : 101. The applicable / latest revision number of this document is indicated in the Tender / Purchase order. Test certificate in IBR Form IIIA format meeting IBR requirement shall be furnished. The Pipes used shall be of renowned make and the same shall be indicated in the Technical part of the bid. Vendors shall procure the pipes only from Pipe manufacturers approved by BHEL.

2.3 All pipes used shall be of single length without joints. In case of any joints to make up the required length, specific approval shall be taken from BHEL during Technical bid discussions.

3.0 FORGINGS.

3.1 Material: SA 105, SA 182 F11, F12, F22, F91.

3.2 Carbon content of SA105 items shall be restricted to 0.25% maximum.

3.3 SA 182 F91 forgings 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 ± 10 deg C

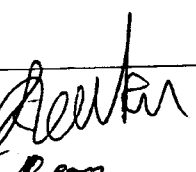
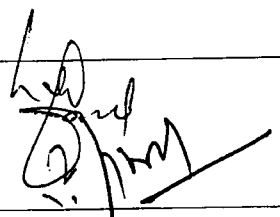

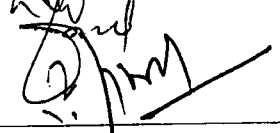
3.4 Unless otherwise specified in the P.O, items of SA182 F11/12 shall be supplied as per class 2 and SA182 F22 shall be supplied as per class 3 only

3.5 Product analysis shall be carried out on One piece / Heat / HT lot / Size.

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

3.7 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.

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

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P. Elangovan, QA		K. Ganeshan, MPL		

3.9 Hardness test shall be carried out on all items of F91, and minimum 10% for other material Grades; acceptance norm shall be as per relevant material specification (SA 105 / SA 182).

3.10 All forgings shall be tested by MT as per ASTM E-709 and acceptance norm shall be as per ASME B 31.1 Clause 136.4.3

3.11 Forgings of all thickness shall be ultrasonically tested as per SA 388 and acceptance norms shall be as per 3.3.4 of ASME Section VIII Division 2.

3.12 Metallography:- Metallography shall be carried out on one per heat, per size, per heat treatment lot of F91 forgings. 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.

3.13 Test certificate in IBR Form IIC format meeting IBR requirement shall be furnished.

4.0 PLATES FOR BOTTOM SUPPORT AND STRUCTURAL ATTACHMENTS:

4.1 The Plates used for bottom support and structural attachments (non pressure retaining part) shall meet the respective material specification indicated in the drawing and necessary test certificate shall be furnished.

5.0 FABRICATION

5.1 Fit up, fabrication, dimension and tolerance shall be as per BHEL drawing

5.2 Welding : WPS and PQR shall be approved by well known independent inspecting agencies like Lloyds, BV, SGS, Copy of approved WPS & PQR shall be furnished along with the Technical part of the bid for approval by BHEL. The welders shall be qualified as per ASME Sec IX and IBR.

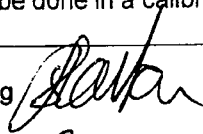



5.2.1 Welding of F91 / P91 material :
 GTAW rods (ER 90S – B9) and SMAW electrodes (E9015 – B9) used shall be of following makes.


- a) Bohler Schweisstechnik Austria, Austria
- b) Bohler Thyssen Schweisstechnik, Germany
- c) Kobe Steels Ltd., Japan
- d) Oerlikon Welding Ltd, Switzerland
- e) Metrode Products, U.K

The core wire chemistry shall be equivalent to F91/ P91 . Synthetic electrodes are not permitted.




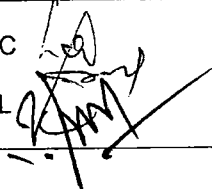
5.2.2 For F91 / P91, PWHT shall be done immediately after welding.


5.3 PWHT shall be done in a calibrated furnace.

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	Bharat Heavy Electricals Limited, Piping Centre, Chennai Technical Delivery Conditions for Pipe with Stubs, Branches and Attachments (Imported)	TDG:109 05.03.2010 Page 3 of 6
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- 5.4 PWHT for F91 / P91 material shall be 760 ± 10 deg C. Holding time shall be minimum 2 hours for thickness up to 50mm; minimum 4 hours for thickness 51 to 100 mm.
- 5.5 PWHT for other material shall be as per ASME B31.1. However, the holding time shall be 30 minutes minimum for SA 105, SA 106; 60 minutes minimum for P11, P12 & P22 materials.
- 6.0 NON DESTRUCTIVE EXAMINATION**
- 6.1 All NDE shall be done after PWHT only – and witnessed by Inspection authorities.
- 6.2 NDE procedures (PT, MT, UT, RT and Hardness) shall be approved by BHEL
- 6.3 **Pipe to Stub / Branch weld** - shall be subjected to UT, PT and MT as per ASME Section V - article 4, 6 and 7 respectively and acceptance as per ASME B31.1 Cl 136.4.6, 136.4.4 and 136.4.3 respectively.
- 6.3.1 **Pipe to Stub / Branch Welds for SA335P91 materials** - shall be subjected to wet MT, PT & UT. The wet MT and PT shall be as per ASME Section V-article 7, 6 respectively and acceptance norms shall be as per ASME B31.1 Cl 136.4.3, 136.4.4 respectively. The methodology and acceptance for UT shall be as per AD 2000 Merkblatt HP 5/3-2002 Edition, with additional requirements as in 6.6.1 through 6.6.3 below.
- 6.4 **Pipe to structural attachment (non pressure retaining part) weld** - shall be subjected to MT (for SA335P91 materials- wet MT) and PT as per ASME Sec V article 7, 6 respectively. The acceptance norms shall be as per ASME B 31.1 Cl 136.4.3 and 136.4.4 respectively.
- 6.5 **Butt welds** - shall be subjected to MT and RT as per ASME Sec V. Evaluation and acceptance norms shall be as per ASME B31.1 Clause 136.4.3 and 136.4.5 respectively.
- 6.6 **Butt welds for SA335P91** shall be subjected to wet MT, RT and UT. The wet MT and RT shall be as per ASME Sec V. Evaluation and acceptance norms shall be as per ASME B31.1 Clause 136.4.3 and Clause 136.4.5 respectively. The methodology and acceptance for UT shall be as per AD 2000 Merkblatt HP 5/3-2002 Edition, with additional requirements as in 6.6.1 through 6.6.3 below.
- 6.6.1 The examination shall be conducted by Pulse Echo contact testing. The following digital equipments or its equivalent models with A-scan presentation that generates and receives frequencies in the range of 1 MHz to 5 MHz. shall be used for examination:
GE Inspection Technology (Krautkramer make), Olympus (EPOCH IV, XT), Sonatest (Master scan series-350M/380M)U.K

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P. Elangovan, QA 	K. Ganeshan, MPL 

	Bharat Heavy Electricals Limited, Piping Centre, Chennai Technical Delivery Conditions for Pipe with Stubs, Branches and Attachments (Imported)	TDG:109 05.03.2010 Page 4 of 6
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The calibration blocks used shall be of same material specification, diameter & thickness.

The UT equipment shall be calibrated at the beginning of each period of extended use or every 3 months whichever is less.

- 6.6.2 All recordable indications will be stored in memory of either the digital flaw detector or a PC for review at a later period.
- 6.6.3 The equipment calibration data for specific weld as well as the hard copy of 'Static echo- trace pattern'- showing the flaw-echo amplitude with respect to DAC, flaw depth, projection surface distance (probe position) and beam-path shall be attached to UT test report. This hard-copy of echo-trace with equipment calibration data will form part of test documentation.
- 6.7 All pipe ends after edge-preparation as per BHEL drawing shall be subjected to PT as per ASME Sec V. The acceptance norms shall be as per ASME B 31.1 Cl 136.4.4.
- 6.8 Qualified Level II personnel (in accordance with SNT-TC-1A of ASNT) shall perform the examination as well as evaluation, and a test report shall be issued.
- 6.9 Hardness test shall be carried out and report to be furnished. The maximum hardness (HV10) for SA335P91 material shall be 300 and for others namely SA335P11,P12,P22 shall be 225.

7.0 POSITIVE MATERIAL IDENTIFICATION (PMI) FOR ALLOY STEEL MATERIAL

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

8.0 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. Repair on parent material (Pipe, Forging, Plate) by fusion welding are prohibited.

9.0 PAINTING, COLOUR CODING, MARKING

- 9.1 **PAINTING:** All components shall be painted on the external surface as given below

- a) Surface preparation : Blast cleaning
- b) Painting : Seaworthy Epoxy painting of DFT – 100 microns with colour shades as given below.
- c) Shade : (i) Smoke grey -- for all carbon steel components
(ii) Sea green -- for all Alloy steel components

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P. Elangovan, QA

Approved by

K. Vedaprasad, QC

K. Ganeshan, MPL

The internal surface shall be protected with rust preventive coating or rust inhibitor. Stainless steel components need not be painted.

- 9.2 **COLOUR CODING:** All components shall be colour coded circumferentially at ends as given below

SA 105 / SA 106 Gr.C	=	Blue
SA 182 F11 / SA 335 P11	=	Green & White
SA 182 F12 / SA 335 P12	=	Black & Red
SA 182 F22 / SA 335 P22	=	Blue & Red
SA 182 F91 / SA 335 P91	=	Brown & Red

9.3 **MARKING:**

- 9.3.1 The Pipe with stubs 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). In addition, the above details along with size shall be paint stencilled on the finished component.

- 9.3.2 The Pipe with stubs dispatched directly to project site as **DTS** shall be punched and paint stencilled with DU code (14 digit Work order DU detail) as given by Purchase in addition to marking done as per para 9.3.1.

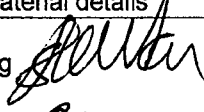
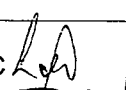

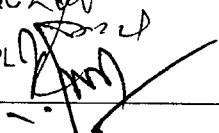
- 10.0 **PACKING AND END PROTECTION:** Machined ends of the Pipe with stubs shall be well protected using end caps and the materials shall be suitably packed in box / crate to avoid transit & other damages.


- 11.0 **MANUFACTURING QUALITY PLAN:** Vendor shall submit manufacturing Quality Plan along with technical part of the bid for BHEL approval.

12.0 **INSPECTION & CERTIFICATION**

- 12.1 All items are to be inspected at the manufacturer's works by the Inspection agencies / authorities as per IBR. Inspection certificate for finished product in IBR Form IIIA shall be submitted along with the Work Test Certificate (EN 10204 Type 3.2) countersigned by authorities as per IBR and shall include the following details. (Three ink signed originals required)

- i. Test Certificate Number & date.
- ii. BHEL P.O Number & Amendment Number(if any)
- iii. BHEL P.O. Serial Number
- iv. BHEL TDC Number, Drawing number
- v. Size-wise Quantity
- vi. Specification, Grade & Year of code.
- vii. Heat / Melt Number
- viii. Steel making process.
- ix. Material details


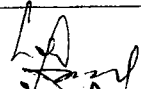

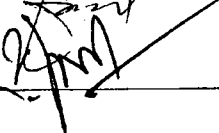
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	Bharat Heavy Electricals Limited, Piping Centre, Chennai Technical Delivery Conditions for Pipe with Stubs, Branches and Attachments (Imported)	TDG:109 05.03.2010 Page 6 of 6
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- x. Ladle and product Analysis of Raw Material.
- xi. Tensile Test
- xii. Bend Test
- xiii. Guarantee of HTP shall be given in the test certificate as follows, if hydro test is not carried out: - "Fabricated Pipe with stubs, branches and attachments are capable of withstanding without failure, breakage or impairment of their serviceability a hydrostatic test pressure equal to that prescribed for the specified matching pipe of equivalent material".
- xiv. References to the NDT & other test reports covered in 12.2 below.

12.2 The following reports shall be furnished separately along with the Form III A & MTC indicated in para 12.1 above.

- i. NDE reports for VT, PT, MT, RT, UT (UT Reports in soft copy + hard copy)
- ii. Positive Material identification (PMI) report for Alloy steel.
- iii. Heat Treatment Chart.
- iv. Hardness Test report
- v. Metallography Report along with photomicrograph with minimum 500x magnification.
- vi. Dimensional report.

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P. Elangovan, QA			K. Ganeshan, MPL	



1.0 GENERAL

Materials: SA106GrB, GrC; SA 335 P11,P12,P22 & P91.

This Technical Delivery Conditions specify the requirements in addition to ASME SA 106, SA 335. If the blooms for SA 335 pipes are sourced from India, then the sources shall be, TISCO, MUSCO and ASP Durgapur - which are IBR approved.

2.0 CHEMICAL COMPOSITION

For SA106 Gr B and Gr C :- Carbon content shall be limited to 0.25% max. for pipe thickness up to and including 20 mm; and 0.30% max. for pipe thickness above 20 mm.

3.0 TOLERANCES

3.1 **OD specified pipes:-** Unless otherwise specified in the PO, tolerances shall be as below.

- Outside diameter : $\pm 1\%$ (Max. 4 mm)
- Wall thickness as per SA 530
- Weight tolerance as per SA 530

3.2 **ID specified pipes:-** Unless otherwise specified in the PO, tolerances shall be:

- ID: + 0.0mm, -3.2mm
- Thickness: +3.2mm, -0.0mm

4.0 MECHANICAL TESTS

Number of Test (as per IBR): 2 numbers up to first 100 pipes and additional 1 number per subsequent 100 pipes or part thereof.

5.0 **SUPPLEMENTARY TESTS:** These are applicable to SA 106 Cr C, SA335 P11, P12, P22, P91. The supplementary test results shall be indicated in the Test Certificate along with the mandatory test results.

5.1 **Product Analysis -S1:-** Product Analysis shall be carried out on 5% of pipes per lot per heat (minimum 2 Nos)

5.2 **Transverse tension test- S2:-** Transverse tension test shall be carried out (for size NB 200 mm and above) on one end of 5% of pipes per lot (minimum 1 No).

6.0 HARDNESS FOR SA 335 P91 PIPES:-

Hardness test shall be carried out on each SA 335 P91 pipes. The values shall be 180-250 BHN and shall be indicated in the Test certificate.

7.0 NON DESTRUCTIVE TEST

Each pipe shall be ultrasonically tested as per ASTM E 213 in both clockwise & anticlockwise directions; calibration to be done on two axial notches of 50 mm length (inside & outside) and a depth of 5% of wall thickness (minimum 0.3 mm; maximum 1.5mm). The results shall be indicated in the Test Certificate.

8.0 REPAIR:-

Repair by welding is prohibited.

The pipe shall meet the dimensional tolerance (clause 3.0 above) after any mechanical repair as permitted in the standard.

S. Jayakumar, Engg
P. Elangovan, QA
K. Ganeshan, MM

Approved by

V. Krishnan, Commercial
B. Prakash Rao, Q & MS
R. Easwaran, Quality, HPBP



9.0 WORKMANSHIP:-

All pipes shall have smooth surfaces, free from loose scales and defects like laps, seams, folds, cracks, pitting etc. The surface imperfection beyond the permissible limit of ASME SA106 / SA335 shall be removed mechanically without affecting the minimum thickness and workmanlike finish.

10.0 MARKING

The following details are to be marked on the consignment for identification

- | | | |
|---------------------|---------------------------|--------------------------|
| 1) PO Number | 2) Supplier's emblem/code | 3) Specification & grade |
| 4) Heat number | 5) Size | 6) No. of pipes |
| 7) Inspector's seal | | |

OD up to 31.8 mm (excluding)	Details 1 to 7 shall be stamped on metal / plastic tag attached to bundle
OD 31.8 mm to OD 76.1mm (including)	<ul style="list-style-type: none">• Details 1 to 5 shall be paint stencilled on each pipe.• Details 1 to 7 to be stamped on Metal / Plastic tag attached to bundle.
OD above 76.1 mm	<ul style="list-style-type: none">• Details 2,3,4,5 & 7 shall be hard stamped with round edged stamp at 100mm from an end of each pipe.• Details 1 to 5 shall be paint stencilled on each pipe.

11.0 COLOUR CODING

Longitudinal colour bands shall be made throughout the length of the pipe. The colours shall be as per BHEL procedure SIP: PP: 21.

12.0 PRESERVATION

- Outside:- resin type rust preventive coating with visibility to stencilled details.
- Inside:- rust inhibitor or resin type rust preventive coating.
- Ends of the pipes shall be secured with caps.

13.0 INSPECTION AND CERTIFICATION

Products must be inspected and certified by the IBR approved Inspecting Authority in IBR FORM III B (i) for tubes and FORM III A (i) for pipes

Well-known pipe or tube maker (recognised in IBR) to submit IBR FORM III D or III E respectively (Mill Certificate).

*** ** *

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P. Elangovan, QA		B. Prakash Rao, Q & MS
K. Ganeshan, MM		R. Easwaran, Quality, HPBP