HYDERABAD

PRODUCT STANDARD

BHEL, HYDERABAD –32.

PROJECT ENGINEERING - MECHANICAL

PURCHASE SPECIFICATION FOR PIPES (MS)

Ref. Doc		Revisions : 03 Refer to record of revisions :	Prepared : --SD-- Amit Kumar	Approved : --SD-- Kumar Gunjan	Approved : --SD-- Srinivasa Rao M.N	Date : 07.05.2015

1. SCOPE :

Vendor's scope of supply shall be as follows:

Sl. No.	Description	Quantity (in meters)	OD x Thickness (in mm)	Applicable Standard	Grade
1.	25 NB MS Pipe	60	34.2 x 3.2	IS-1239 Part-I	Medium
2.	50 NB MS Pipe	12	60.8 x 3.6	IS-1239 Part-I	Medium
3.	80 NB MS Pipe	54	89.5 x 4.0	IS-1239 Part-I	Medium
4.	100 NB MS Pipe	2052	115.0 x 4.5	IS-1239 Part-I	Medium
5.	150 NB MS Pipe	768	166.5 x 4.8	IS-1239 Part-I	Medium
6.	200 NB MS Pipe	1542	219.1 x 6.35	IS-3589	Medium, Grade Fe410
7.	250 NB MS Pipe	504	273 x 6.35	IS-3589	Medium, Grade Fe410
8.	300 NB MS Pipe	8436	323.9 x 6.35	IS-3589	Medium, Grade Fe410
9.	400 NB MS Pipe	36	406.4 x 6.35	IS-3589	Medium, Grade Fe410
10.	600 NB MS Pipe	60	610 x 6.35	IS-3589	Medium, Grade Fe410
11.	700 NB MS Pipe	30	711 x 6.35	IS-3589	Medium, Grade Fe410

2. COMPLIANCE WITH STANDARDS:
Dimensions, Tolerances and other requirements as per individual standards listed in Annexures 4 and 5.

3. TECHNICAL DELIVERY CONDITIONS:
As per corporate standard No. AA 049 00 01-R04

4. IBR ATTESTATION:
IBR attestation is not required for the fire water lines.

5. PAINTING:

All pipes shall be applied with rust preventive coating (Two coats of grey zinc primer with minimum dry film thickness (DFT) of 25 microns per coat) on the outside and either with a rust preventive coating or rust inhibitor on the inside **to provide protection against corrosion for a period of 36 months for outdoor storage in industrial atmospheres**. This requirement supersedes the requirement as indicated in Cl. No. 3.2 of AA 0490001 Rev 04.

6. LIST OF ANNEXURES:

Annexure no.	Description of Document
Annexure-1	Price Bid Format
Annexure-2	Manufacturing Quality Plan for Pipes
Annexure-3	Pre-bid Queries Format
Annexure-4	ERW Pipe as per IS 1239 - Spec No. AA10152-R06
Annexure-5	ERW Pipe as per IS 3589 - Spec No. AA10147-R05
Annexure-6	Procedure for Marking-Spec No. AA0490001-R04
Annexure-7	Checklist for Offer Submission

VARIANT TABLE (FOR BHEL INTERNAL ONLY)

Variant No.	Item	Material code	Project
01	25 NB MS Pipe	PY9751166012	2x660 MW Suratgarh,STPP
02	50 NB MS Pipe	PY9751166020	2x660 MW Suratgarh,STPP
03	80 NB MS Pipe	PY9751166039	2x660 MW Suratgarh,STPP
04	100 NB MS Pipe	PY9751166047	2x660 MW Suratgarh,STPP
05	150 NB MS Pipe	PY9751166055	2x660 MW Suratgarh,STPP
06	200 NB MS Pipe	PY9751166063	2x660 MW Suratgarh,STPP
07	250 NB MS Pipe	PY9751166071	2x660 MW Suratgarh,STPP
08	300 NB MS Pipe	PY9751166080	2x660 MW Suratgarh,STPP
09	400 NB MS Pipe	PY9751166098	2x660 MW Suratgarh,STPP
10	600 NB MS Pipe	PY9751166101	2x660 MW Suratgarh,STPP
11	700 NB MS Pipe	PY9751166110	2x660 MW Suratgarh,STPP

HYDERABAD

PRODUCT STANDARD

BHEL, HYDERABAD –32.

PROJECT ENGINEERING – MECHANICAL

PY 51166

Rev No. 03

RECORD OF REVISIONS

Rev. No.	Date	Revision Details	Revised by	Checked by	Approved by
00	12.03.15	FRESH ISSUE	--		
01	17.03.15	Addition of Painting requirement			
02	11.04.15	Correction in Price bid format			
03	07.05.15	Correction in Price bid format			

Ref. Doc.

ANNEXURE-1

PRICE BID FORMAT FOR PIPES

Document No: Pipes/Suratgarh/001

PROJECT: 2 x 660 MW SUPER-CRITICAL TPS,STAGE –V, UNIT 7 & 8 AT SURATGARH, RAJASTHAN Rev No: 03

SPEC NO: PY 51166 Rev 03 Date: 07.05.15

S.NO	PIPE SIZE	OD (max) X Thickness in mm	APPLICABLE STANDARD	DESCRIPTION	MATERIAL	LENGTH IN 'Meters'	PART NO.	UNIT RATE	TOTAL AMT
1	25 NB	34.2 x 3.2	IS-1239 Part-I	Welded	MS Pipe	60	3868501		
2	50 NB	60.8 x 3.6	IS-1239 Part-I	Welded	MS Pipe	12	3868502		
3	80 NB	89.5 x 4.0	IS-1239 Part-I	Welded	MS Pipe	54	3868503		
4	100 NB	115.0 x 4.5	IS-1239 Part-I	Welded	MS Pipe	2052	3868504		
5	150 NB	166.5 x 4.8	IS-1239 Part-I	Welded	MS Pipe	768	3868505		
6	200 NB	219.1 x 6.35	IS-3589, Grade 410	Welded	MS Pipe	1542	3868506		
7	250 NB	273 x 6.35	IS-3589, Grade 410	Welded	MS Pipe	504	3868507		
8	300 NB	323.9 x 6.35	IS-3589, Grade 410	Welded	MS Pipe	8436	3868508		
9	400 NB	406.4 x 6.35	IS-3589, Grade 410	Welded	MS Pipe	36	3868509		
10	600 NB	610 x 6.35	IS-3589, Grade 410	Welded	MS Pipe	60	3868510		
11	700 NB	711 x 6.35	IS-3589, Grade 410	Welded	MS Pipe	30	3868511		
								GRAND TOTAL	

Notes:

1. Bidder to note that this is a UNIT RATE CONTRACT.
2. Each of the items i.e. Sl. No. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11 shall be evaluated separately.
3. Bidder to quote strictly as per BHEL's specification requirements. Responsibility of ensuring correctness & completeness of scope of supply as per specification requirement solely lies with bidder.
4. Bidder to quote the base rates only. Applicable taxes and duties to be indicated separately.

ANNEXURE-2

	MANUFACTURING QUALITY PLAN								MQP. NO.: SMQP/FPS/06/092013					
	PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032				PRODUCT:PIPES				REV NO: 00	DATE: 01/09/2013				
									PAGE 1 OF 2					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS	
1.0	**RAW MATERIALS & BOUGHT OUT ITEMS**													
	Raw Material (Mother Hollow, Billets etc.)	Mechanical & Chemical Properties	Major	Mech., Chem. Analysis	One per Lot/Batch /Heat	BHEL Spec	BHEL Spec	MTC	√	2		1		
2.0	**INPROCESS INSPECTION**													
		Heat Treatment	Major	TC Review	One per Lot/Batch /Heat	BHEL Spec	BHEL Spec	TC, HT Chart	√	2	2	1	*If applicable	
		WPS, PQR, WPQ*	Major	Doc. Review	100%	BHEL Spec	BHEL Spec	WPS,PQR, WPQ	--	2		1	*for Welded pipes	
		NDE*	Critical	RT/UT /LP	As per BHEL Spec	BHEL Spec	BHEL Spec	NDE Reports	√	2		1	*as applicable	
3.0	**FINAL INSPECTION & TESTING**													
	PIPES	Mechanical Analysis (UTS, YS, EL, BEND/Flattening)	Major	Mech. Analysis	One per Lot/Batch /Heat	BHEL Spec	BHEL Spec	MTC	√	2		1		
		Chemical Analysis	Major	Chem. Analysis	One per Lot/Batch /Heat	BHEL Spec	BHEL Spec	MTC	√	2		1		
		Dimensional (OD, ID, Length, Thickness, Edge preparation, Straightness, etc.)	Critical	Measure ment	100%	BHEL Spec	BHEL Spec	TC	√	2	1		10% Witness by BHEL/BHEL's TPIA	
		Hydrostatic Test/ Eddy Current test/ Ultrasonic test	Critical	Hydro Test ET/UT	100%	BHEL Spec	BHEL Spec	TC	√	2	1		10% Witness by BHEL/BHEL's TPIA	
		IBR Certificate*	Critical	TC Review	100%	BHEL Spec	BHEL Spec	TC	√	2		1	*If applicable	
		PMI*	Critical	PMI test	Random	BHEL Spec	BHEL Spec	TC	√	2	1		*If applicable	

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P	AGENCY W	AGENCY V	REMARKS
		Galvanizing (Coating weight, uniformity, Adherence)	Critical	Strip test, Preece test, Bend/ Pivot hammer test	Random	BHEL Spec	BHEL Spec	TC	√	2	1		*for G.I Pipe
4.0	**PRESERVATION & PACKING**												
		Painting*, (Shade, DFT Check) Marking	Major	Visual, Measure ment	Random	BHEL Spec	BHEL Spec	TC	√	2	1		*if applicable
		Packing*	Major	Visual	Random	BHEL Spec	BHEL Spec	Packing List	√	2		1	

NOTE:-

1. **This standard MQP should be read along with specification (latest revision), approved drawings & approved data sheet.**
2. **Drawing/data sheet shall prevail over quality plan for contradiction if any between quality plan and drawing/specification.**
3. **All test certificates/reports reviewed and certified by TPI/BHEL shall be submitted to BHEL as documentation package.**
4. **All type test reports submitted shall not be older than 5 yrs from the date of purchase order.**
5. **Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.**

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL / BHEL NOMINATED INSPECTION AGENCY/END USER/END USER'S REPRESENTATIVE & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY BHEL QA SIGNATURE & STAMP	APPROVED BY BHEL QA SIGNATURE & STAMP	APPROVED BY CUSTOMER'S SIGNATURE & STAMP (IF APPLICABLE)

ANNEXURE - 3

PRE-BID QUERRIES FROM SPECIFICATION

If the proposal submitted has got any Queries from the technical stipulations in the bidding document, the Bidder shall tabulate below the full particulars of such Queries and shall sign below. Additional sheets may be enclosed, if necessary. Queries are to be furnished with mention of specific clause numbers. Technical and commercial Queries to scope of supply and services shall be indicated separately.

SL.No.	Clause No.	Description as per specification	Queries by Bidder

We confirm that all the Pre-Bid Queries to the Technical Specification, Job Specification and enclosures including reference documents attached are listed in this Annexure only. No other Pre-Bid Queries even if mentioned elsewhere shall be considered for any technical/ commercial evaluation or for ordering.

Bidder's Signature…….

Date:……

ANNEXURE-4

	CORPORATE PURCHASING SPECIFICATION	AA 101 52
		Rev. No. 06
		PAGE 1 OF 4

STEEL TUBES - ELECTRIC RESISTANCE WELDED / SUBMERGED ARC WELDED

1.0 GENERAL:

This specification governs the quality requirements of light, medium and heavy grades of Electric Resistance Welded/Submerged Arc Welded steel tubes with plain ends in ungalvanized and galvanized condition in the range of 60mm to 150mm NB.

2.0 APPLICATION:

For general purpose, suitable for bending, welding and screwing for flanges and fittings. Not suitable for steam services.

3.0 CONDITION OF DELIVERY:

Tubes shall be supplied with plain ends.

The ends shall be cut cleanly and square with the axis of the tube.

Unless otherwise specified, tubes shall be supplied in ungalvanized condition.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall comply with the requirements of the following National standard and also meet the requirements of this specification.

IS : 1239(part 1) - 2004: Steel Tubes, Tubular and other Wrought Steel Fittings
Gr: ERW .

5.0 DIMENSIONS AND TOLERANCES :

5.1 Sizes:

BHEL order shall clearly state the maximum outside diameter, and wall thickness of the tube.

5.2 Tolerances:

5.2.1 Thickness:

Light tubes	+	Not limited
	-	8 percent
Medium and Heavy tubes	+	Not limited
	-	10 percent

5.2.2 Weight:

Single tube (light series)	+ 10 percent - 8 percent
Single tube (medium and heavy series)	± 10 percent
For quantities per load of 10 tonnes, min (light series)	+ 7.5 percent - 5 percent
For quantities per load of 10 tonnes, min (medium and heavy series)	± 7.5 percent

5.2.3 Internal Weld Fin:

Height of the internal weld fin shall not be greater than 60 percent of the specified thickness.

5.2.4 Length:

5.2.4.1 Random Length:

Tubes shall be supplied in random lengths of 4 to 7 metres, unless otherwise specified and in the line with IS: 1239, Pt. 1.

5.2.4.2 Exact Length:

When exact lengths are called for, the tolerances shall be + 6mm, - 0 mm of the specified length.

6.0 MANUFACTURE:

Tubes shall be made form tested quality steel manufactured by any approved process and shall be fully killed.

Tubes shall not be manually welded.

7.0 FREEDOM FOR DEFECTS :

Tubes shall be cleanly finished and reasonably free from injurious defects. They shall be reasonably straight. The ends shall be cut cleanly and reasonably square with the axis of the tube.

8.0 CHEMICAL COMPOSITION :

The melt analysis of steel shall be as follows:

Element	Percent, max.	Permissible variation over specified limit, ± max
Carbon	0.20	0.02
Manganese	1.30	0.04
Sulphur	0.040	0.005
Phosphorus	0.040	0.005

9.0 GALVANIZING:

When galvanized tubes are ordered, the Zinc coating on the tubes shall be in accordance with IS: 4736.

10.0 TEST SAMPLES:

All tubes bearing the same designation and manufactured under a single process shall be grouped together to constitute a lot. Each lot shall be sampled separately in accordance with IS: 4711.

11.0 MECHANICAL PROPERTIES :

11.1 Tensile:

The tensile strength of strips cut form selected tubes, when tested in accordance with IS:1608 shall be as follows:

Tensile strength : 320 N/mm^2 , min.

Elongation on 5.65 $\sqrt{}$ So gauge length:

Upto and Incld. 25 mm NB	:	12 percent, min.
Over 25 mm upto incld. 150 mm NB	:	20 percent, min.

Note: 1. For welded tubes, the strip tensile test specimen shall not contain the weld.
2. For galvanized tubes, zinc coating may be removed by stripping prior to tensile test.

11.2 Bend Test (On tubes upto and including 50mm Nominal bore):

When tested in accordance with IS:2329, the tubes shall be capable of withstanding the bend test without showing any signs of fracture or failure.

Tubes shall be bent with the weld at 90^0 to the plane of bending. The tubes shall not be filled for this test.

Ungalvanised tubes shall be capable of being bent cold without cracking, through 180^0 around a former having a radius at the bottom of groove in the plane of bending equal to at least six times the outside diameter of the tube.

Galvanized tubes shall be capable of being bent cold without cracking of the steel, through 90^0 round a former having a radius at the bottom of the groove equal to at least eight times the outside diameter of the tube.

11.3 Flattening Test (On tubes above 50mm Nominal bore):

Rings not less than 40mm in length, cut form the end of each selected tubes shall be flattened between parallel plates with the weld at 90^0 (point of maximum bending) in accordance with IS:2328. No opening shall occur by fracture in the weld until the distance between the plates is less than 75 percent of the original outside diameter of the tube and no cracks or breaks on the metal elsewhere than in the weld shall occur until the distance between the plates is less than 60 percent of the original outside diameter.

Test rings may have the inner and outer edges rounded.

11.4 Hydraulic Test/Eddy Current Test:

Each tube shall withstand a test pressure of 5 N/mm^2 without showing leakage defects of any kind. The pressure shall be applied and maintained for a minimum period of 30 seconds for proof and inspection.

Note: Eddy current test may be done in place of Hydrostatic test as per the procedure in Annexure-B of IS: 1239, Part-1.

12.0 TEST CERTIFICATES :

Three copies of test certificates shall be supplied, unless otherwise stated on the order.

In addition, to the above, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

AA 101 52: Rev. No. 06: Steel tubes-ERW/SAW

BHEL order No,
Supplier's Reference :

Name
Identification No.
Melt No.

Results of Tests :

Results of Chemical, Mechanical tests and Hydraulic/Eddy Current test,

13.0 PROTECTIVE COATING

The shall be protected with a rust preventive coating of varnish, externally throughout the length.

14.0 PACKING AND MARKING :

Each tube shall be plugged at both ends by means of tight fitting end caps.

The tubes shall be suitably packed in bundles/packages to prevent corrosion and damage during transit.

Each bundle/package shall bear the following information:

AA 10152: Steel Tubes - ERW/SAW

BHEL Order No.

Consignment/Identification No.

Out side Diameter and Wall Thickness.

Supplier's Name

15.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS: 1239 2. IS : 1608 3. IS:2328 4. IS:2329
5. IS:4711 6. IS : 4736

ANNEXURE-5

	CORPORATE PURCHASING SPECIFICATION	**AA 101 47**
		Rev. No. 05
		PAGE 1 OF 4

CARBON STEEL PIPES-ELETRIC RESISTANCE WELDED/SUBMERGED ARC WELDED

1.0 GENERAL:

This specification governs the quality requirements of Electric Resistance Welded/Submerged Arc Welded, Carbon Steel Pipes, of 168.3 mm to 2540 mm.

2.0 APPLICATION:

For conveying gas, water and oil.

3.0 CONDITION OF DELIVERY:

Pipes shall be supplied in straight lengths with plain ends.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall comply with the requirements of the following National standard and also meet the requirements of this specification.

IS : 3589 - 2001	: Steel pipes for water and sewage
Gr: ERW - Fe 410	:

5.0 DIMENSIONS AND TOLERANCES :

5.1 Sizes:

Pipes shall be supplied to the dimensions specified on BHEL order.
BHEL order shall clearly state the outside diameter and well thickness of the pipe.

5.2 Tolerances:

5.2.1 Wall Thickness:

The tolerances on wall thickness of the pipes shall be ± 10% for ERW and +20%, - 12.5% for SAW.

5.2.2 Straightness:

The deviation from a straight line shall not exceed 0.2% of the length.

5.3 Length:

Pipes shall be supplied in random length of 4 to 7 metres unless exact lengths are called for in BHEL order.

Revisions:			APPROVED: INTERPLANT MATERIAL RATIONALISATION COMMITTEE-MRC (S&GPS)		
Cl. 26.6.13 of MOM of MRC-S&GPS					
Rev. No. 05	**Amd.No.**	**Reaffirmed**	**Prepared**	**Issued**	**Dt. of 1st Issue**
Dt: 15.01.2004	**Dt :**	**Year :**	**BHOPAL**	**Corp. R&D**	**AUGUST, 1976**

6.0 MANUFACTURE:

Electric Resistance Welded and Induction Welded, Submerged Arc Welded:

The pipes shall be made from steel plates or strips by butt welding longitudinally or spirally. The weld shall be continuous. Prior to welding, edges or plates or strips may be prepared suitably where required, by process of manufacture.

7.0 FREEDOM FOR DEFECTS :

All pipes shall be cleanly finished and when visually inspected shall be free defects such as cracks, surface flaws, laminations etc. The ends shall be cleanly cut and reasonably square with the axis of the pipes.

8.0 CHEMICAL COMPOSITION :

The laddle analysis of steel and the maximum permissible variation in the composition of the product from the melt analysis shall be follows :

Element	Melt analysis, percent, max.	Permissible variation, for product analysis, max
Carbon	0.20	+ 0.02
Sulphur	0.040	+ 0.005
Phosphorus	0.040	+ 0.005
Manganese	1.30	+ 0.04

9.0 TEST SAMPLES :

Unless otherwise agreed between BHEL and manufacturer, the procedure for sampling of pipe for various tests and criteria for conformance shall be as given in IS:4711. Test samples shall be cut from pipes in final condition of supply.

9.1 Flattening Test:

For pipes produced in single lengths the flattening test shall be made form each end with the welds at 0^0 and 90^0.

For pipes produced in multiple lengths, tests shall also be made on two intermediate rings cut from each multiple lengths of pipe in the weld at 0^0.

10.0 MECHANICAL PROPERTIES :

10.1 Tensile:

When tested in accordance with IS:1608, the tensile properties of strip cut longitudinally (excluding weld) from selected pipe shall show properties given below :

Tensile strength	:	410 MPa, min
Yield stress	:	235 MPa, min.
Elongation on 5.65 √So gauge length	:	18 percent , min.

10.2 Fattening Test (For ERW pipes):

A ring not less than 40mm in length taken form the end of each selected tube shall be flattened between parallel plates as follows, in accordance with IS: 3589.

The test shall be made keeping, the weld at 90^0 to the direction of the force. No opening shall occur by fracture in the weld until the distance between the plates is less than 75 percent of the original diameter of the pipe or no cracks or breaks on the metal elsewhere than the weld shall occur until the distance between the plates is less than 60 percent of the original outside diameter.

10.3 Guided bend test (For SAW pipes):

Strips not less than 40mm wide cut circumferentially from pipes perpendicular to weld seam with weld near the middle of sample shall without fracture be doubled over a round bar the diameter of which shall be calculated as given below: The weld reinforcement shall be removed from faces.

One face and one root bend specimen as per fig.1 of IS:3589 shall be bent 180^0 in a jig in accordance with Fig.2 of IS:3589.

$$A = \frac{1.15\,(D-2t)}{eD/t - 2e - 1}$$

1.15 = peaking factor

D = Specified OD in mm

t = Specified wall thickness in mm

e = Strain in mm i.e. 0.1275 for grade Fe 410

Acceptance of bend test shall be as per clause 9.3.2 and 9.3.3 of IS:3589.

11.0 HYDRAULIC TEST:

Each length of the pipe shall be hydraulically tested at the manufacturer's works, before the pipes is coated, wrapped or lined at the manufacturer's works.

The hydraulic test pressure shall be the pressure calculated from the following formula, except that the maximum test pressure shall not exceed 5 MPa:

$P = 2 St/D$

where P = Test pressure in MPa

S = Stress in MPa which shall be taken as 60 percent of the minimum yield stress

t = Specified thickness in mm

D = Specified outside diameter in mm

Test pressure shall be applied and maintained for sufficiently long time for proof and inspection.

NOTE: Normally 5 seconds are sufficient for the purpose of test.

12.0 TEST CERTIFICATES :

Three copies of test certificates shall be supplied, unless otherwise stated on the order.

In addition, to the above, the supplier shall ensure to enclose one copy of the test certificate along with their despatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information :

AA 101 47: Rev. No. 05: Carbon Steel Pipes-ERW/SAW

BHEL order No,
Supplier's Reference :

Name
Identification
Melt No.

Results of Tests :

Results of Dimensional inspection.
Results of chemical analysis and mechanical & hydraulic tests.

13.0 PACKING AND MARKING :

As agreed to between BHEL and manufacturer, surface coating if required shall be as per guide line given in annex A to D of IS:3589. When tubes are required to be galvanised. The zinc coating shall be in accordance with IS: 4736.

Each pipe shall be die-stamped with the following information:

AA 10147: Carbon Steel Pipes - ERW/SAW

BHEL Order No.

Consignment/Identification No.

Out side Diameter and Wall Thickness.

Supplier's Name

14.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS: 1608 2. IS : 3589 3. IS:4711 4. IS:4736

ANNEXURE-6

भीएचईएल BHEL	**CORPORATE STANDARD**	**AA 049 00 01** **Rev. No. 04** **PAGE 1 OF 3**

PROCEDURE FOR MARKING AND PACKING OF SEAMLESS STEEL TUBES & PIPES

1.0 SCOPE

This standard specifies the requirements for marking and packing of seamless steel tubes and pipes.

2.0 MARKING

Sl. No.	Particulars	Upto & incl. 33.4 OD and thickness < 6 mm	Above 33.4 and up to & incl. 114.3 OD and thickness < 6 mm	Other sizes and thickness not covered in columns. (3) & (4)
(1)	(2)	(3)	(4)	(5)
I.	**DETAILS TO BE IDENTIFIED**			
1.	Purchase order No.	1 to 7 to be stamped on aluminium metal tag and securely attached to each bundle	2,3,4 & 5 only to be paint stenciled on each tube. 1 to 7 to be stamped on aluminium metal tag and securely attached to each bundle.	3, 4, & 7 to be hard stamped on the body of pipes 2, 5 and 7 to be paint stenciled on the pipes. (Alternatively paint stenciled is permitted on mutual agreement for 3, 4 & 7 only)
2.	Marker's emblem			
3.	Specn.No.& grade			
4.	Melt Number			
5.	Size (OD X TK X length)			
6.	No. of tubes/pipes			
7.	Inspector's seal			
II	**COLOUR CODING:**	Circumferentially/ Longitudinally	Circumferentially/ Longitudinally	Circumferentially/ Longitudinally

Note: If specified on order , the colour code on pipes and tubes shall be as per Annexure - I

2.1 Stamping shall be done at about 100mm from the ends of the pipe with rounded letters and depth of stamping shall not exceed 0.5 mm.

2.2 Stainless steel tubes/pipes shall be paint stenciled only and the paint shall be free from corrosion promoting agents like sulphur and chlorine.

2.3 Marking shall be legibly done in ENGLISH language only, preferably with a stencil of 20 mm.

Revisions : Cl. 27.6.2 of MRC – FCF+HTM			APPROVED : INTERPLANT RATIONALIZATION COMMITTEE-MRC (FCF+HTM)		
Rev. No. 04	**Amd.No.**	**Reaffirmed**	**Prepared**	**Issued**	**Dt. of 1st Issue**
Dt: 15.11.2002	**Dt :**	**Year :**	**HYDERABAD**	**Corp. R&D**	**JUNE, 1978**

3.0 PRESERVATION

3.1 All painted details shall be protected with one coat of transparent rust preventive.

3.2 Other than stainless steel, all tubes and pipes shall be applied with rust preventive coating on the outside and either with a rust preventive coating or rust inhibitor on the inside **to provide protection against corrosion for a period of 3 months for out door storage in marine / industrial atmospheres.** For heat exchanger tubes, rust preventive coating shall given dry or wet type as specified in BHEL order.

3.3 The ends of the tubes/pipes shall be closed with end caps made of PVC /plastic which should be securely held so that it will not fall off during transit.

Note: The supplier must specify the type of rust preventive at the time of supply and also the method of its easy removal.

4.0 PACKING

4.1
a) Tubes and pipes upto and including 33.4 mm OD and smaller shall be supplied in bundles.
b) Tubes and pipes above 33.4 to 114.3 OD shall also be supplied in bundles, whenever the wall thickness is less than 6.0 mm.
c) Tubes and pipes of OD above 33.4 mm and wall thickness above 6.0 mm shall be supplied loose.

4.2
a) Weight of each bundle shall not exceed 1 metric ton.
b) No wooden pellets should be used to cover the tubes.
c) The bundle must be fastened by using galvanized wire / metal straps.
d) Two straps must be fastened one at each end of the bundle at one metre from the ends. For the balance length, there shall be a wire bundling at reasonable intervals.

4.3 All the tubes of wall thickness 3.2 mm and below shall be properly packed in wooden crates to avoid any dent formation and other transit damages to the tubes.

4.4 A packing list, sealed in a thick polythene cover, shall be sent along with each consignment with the following details:

1. BHEL order number:
2. Number of bundles (including serial number also):
3. Material specification No. and grade:
4. Size of tube/pipe
5. Customer's Name

COLOUR CODES FOR TUBES AND PIPES

ANNEXURE - I

Specification	Colour - 1	Colour - 2	Colour - 3
13 x 1 MF	RED	YELLOW	-
13 Cr Mo 44	ALUMINIUM	BLACK	-
A 200 Gr. T5	ALUMINIUM	RED	YELLOW
A 200 Gr. T9	ALUMINIUM	GREEN	YELLOW
AISI 602	WHITE	YELLOW	-
API 5L Gr. B	ALUMINIUM	-	-
BS 3059 PART2 CDS /HFS 360	ALUMINIUM	BLACK	BROWN
BS 3602 PART 1 CDS 360	ALUMINIUM	BLACK	BLUE
NFA 49 - 213 42 C	ALUMINIUM	BLUE	BROWN
NFA49 - 213 TU 10 CD 9.10	ALUMINIUM	BLUE	RED
NFA49 - 213 TU 15 CD 2.05	ALUMINIUM	BLUE	GREEN
NFA49 - 213 TU Z10 CD 9	ALUMINIUM	BLUE	YELLOW
NFA49 - 213 TU Z10C VNSB 09.01	ALUMINIUM	GREEN	RED
SA 106 Gr. B	RED	-	-
SA 106 Gr. C	BLUE	-	-
SA 179	BLACK	BLUE	GREEN
SA 192	WHITE	-	-
SA 199 T5	BLUE	BROWN	RED
SA 209 Gr. T1	ALUMINIUM	RED	-
SA 210 Gr. A1	YELLOW	-	-
SA 210 Gr. C	BLUE	GREEN	-
SA 213 Gr. T11	ALUMINIUM	YELLOW	-
SA 213 Gr. T12	BROWN	YELLOW	-
SA 213 Gr. T2	BROWN	GREEN	-
SA 213 Gr. T22	GREEN	RED	-
SA 213 Gr. T5	BLACK	BROWN	GREEN
SA 213 Gr. T9	BROWN	WHITE	-
SA 213 Gr. T91	GREEN	YELLOW	-
SA 213 Gr. TP 304	BLUE	GREEN	YELLOW
SA 213 Gr. TP 304 H	BLACK	BLUE	YELLOW
SA 213 Gr. TP 304 L	BLUE	WHITE	YELLOW
SA 213 Gr. TP 304 M	BLACK	BROWN	YELLOW
SA 213 Gr. TP 316	BROWN	-	-
SA 213 Gr. TP 316 Ti	BLACK	BLUE	-
SA 213 Gr. TP 316L	BLUE	BROWN	YELLOW
SA 213 Gr. TP 321	BLUE	WHITE	-
SA 213 Gr. TP 321H	BLACK	WHITE	-
SA 213 Gr. TP 347H	BLACK	YELLOW	-
SA 268 Gr. TP 405	ALUMINIUM	GREEN	-
SA 268 Gr. TP 410	BROWN	RED	YELLOW
SA 268 Gr. TP 443	BLUE	GREEN	WHITE
SA 269 TP 315	GREEN	RED	YELLOW
SA 312 Gr. TP 304	BLUE	YELLOW	-
SA 312 Gr. TP 304L	BLUE	RED	YELLOW
SA 312 Gr. TP 316	BLACK	GREEN	-
SA 312 Gr. TP 304L	BLACK	BLUE	BROWN
SA 312 Gr. TP 321	BLUE	BROWN	-
SA 312 Gr. TP 3347	BLUE	RED	WHITE
SA 333 Gr. 1	BLACK	BROWN	RED
SA 333 Gr. 3	BLACK	GREEN	RED
SA 333 Gr. 6	BLUE	GREEN	RED
SA 334 Gr. 1	BROWN	GREEN	RED
SA 334 Gr. 3	BLACK	RED	YELLOW
SA 334 Gr. 6	BLACK	BLUE	RED
SA 335 Gr. P1	BROWN	GREEN	YELLOW
SA 335 Gr. P11	GREEN	WHITE	-
SA 335 Gr. P12	BLACK	RED	-
SA 335 Gr. P2	BLUE	BROWN	GREEN
SA 335 Gr. P22	BLUE	RED	-
SA 335 Gr. P5	BLACK	BROWN	-
SA 335 Gr. P29	ALUMINIUM	BROWN	-
SA 335 Gr. P291	BROWN	RED	-
SB 163 Incono1	BLACK	GREEN	YELLOW
ST 35.4	ALUMINIUM	BLUE	-
STEEL 20	GREEN	-	-
Structural Tubes & Pipes	BLUE	BROWN	WHITE
X20 Cr Mo V 121	BLACK	-	-

ANNEXURE-7

CHECKLIST FOR OFFER SUBMISSION

Sl. No.	Description	Enclosed (Yes/ No)
1.	Bidder to confirm to the scope of supply as per BHEL spec: PY 51166	
2.	Bidder to quote as per BHEL price format only. Bidder to attached unpriced bid format by indicating “QUOTED” against each item in the technical offer.	
3.	Bidder to confirm painting requirement as per BHEL Spec: PY 51166	