



CORPORATE PURCHASING SPECIFICATION

AA 101 52

Rev. No. 06

PREFACE SHEET

STEEL TUBES - ELECTRIC RESISTANCE WELDED/SUBMERGED ARC WELDED

FOR INTERNAL USE ONLY
REMOVE THIS PREFACE SHEET BEFORE ISSUE TO SUPPLIERS

Comparable Standards:

1. INDIAN : IS : 1239 (part 1) - 2004
 Gr: ERW

Suggested/Probable Suppliers And Grades:

Refer plant vendors list.

User Plant References:

1. BHOPAL : PS 101 52 - Ungalvanized Tubes.
 2. HEER, HARDWAR : PS 101 53 - Galvanized Tubes.
 3. HYDERABAD : HY 012 02 99, HY 021 02 99
 4. TIRUCHY : BM - 32

Revisions :

Cl. 27.6.11 of MOM of MRC-S&GPS

APPROVED :

INTERPLANT MATERIAL RATIONALISATION
 COMMITTEE-MRC (S&GPS)

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BHOPAL

Corp. R&D

JULY, 1976



CORPORATE PURCHASING SPECIFICATION

AA 101 52

Rev. No. 06

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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

Revisions:

Cl. 27.6.11 of MOM of MRC-S&GPS

APPROVED:

INTERPLANT MATERIAL RATIONALISATION
COMMITTEE-MRC (S&GPS)

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BHOPAL

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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 from 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 from selected tubes, when tested in accordance with IS:1608 shall be as follows:

Tensile strength : 320 N/mm² , min.

Elongation on 5.65 √ So gauge length:

Upto and Incl. 25 mm NB : 12 percent, min.

Over 25 mm upto incl. 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° 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° 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° 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 from the end of each selected tubes shall be flattened between parallel plates with the weld at 90° (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.

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11.4 Hydraulic Test/Eddy Current Test:

Each tube shall withstand a test pressure of 5 N/mm² 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		



PLANT PURCHASING SPECIFICATION

HY 10790

REV. No: 02

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SEAMLESS AUSTENITIC STAINLESS STEEL TUBES

(Gr. TP 304)

(ORDERING DESCRIPTION)

1. GENERAL :

The tubes shall comply with the latest version of ASTM:A 269, TP 304 and with the following additional requirements.

2.0 APPLICATION :

For use as impulse pipes in instrumentation for compression fittings.

3.0 DIMENSIONS & TOLERANCES :

The tubes shall be supplied to the dimensions (OD x Thickness) specified in the order. The length of the tube shall be 6 metres unless otherwise specified.

4.0 MANUFACTURE :

- a) Shall be made by the seamless process.
- b) Either hot finished or cold drawn.

5.0 FINISH :

Finished tubes shall be reasonably straight and have smooth ends free from burns. They shall be free from injurious defects and shall have a workman like finish. Minor defects may be removed by grinding, provided the wall thicknesses are not decreased to less than that permitted tolerances.

6.0 HYDROSTATIC OR NON-DESTRUCTIVE ELECTRIC TEST :

Each tube shall be subjected to hydrostatic test as per ASTM: A 450. As an alternative to the Hydrostatic test, each length of the tube having wall thickness of 3.6 mm including and below shall be subjected to Eddy current test and tubes having wall thickness of more than 3.6 mm shall be subjected to ultrasonic test as per BHEL Standard AA0850144. Norms of acceptance shall be as specified in the respective standards mentioned above.

Revisions:

Revised in line with
latest ASTM A 269

ISSUED :

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DEPARTMENT**

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Approved:

Dt. of 1st issue

Dt. APR.99

Dt.

Year:

MATLS. ENGG.

Specialist
Testing & TSD

SEP.86

**PLANT PURCHASING
SPECIFICATION****7.0 FLARING TEST :**

One test shall be made on specimens from one end of one tube from each lot of finished tubes as per ASTM: A 450

8.0 HARDNESS :

Two Nos. of tubes per lot shall be hardness tested and the values shall be as given in ASTM A 269.

9.0 INSPECTION OF SUPPLIER'S WORKS :

The representative of BHEL shall have free access to the supplier's works at all times during the execution of the order, to satisfy himself that the material is produced as per the quality requirements of this specification. All reasonable facilities shall be extended to him, free of charge. He may also witness the sampling, testing and marking called for in this specification.

10.0 TEST CERTIFICATE :

Five copies of the test certificate giving the following details shall be furnished.

- a) BHEL Order No.
- b) BHEL Specification No. HY 10790 Rev.02
- c) ASTM: A 269, TP 304
- d) Melt No.'
- e) Size
- f) Heat treatment details and batch No.
- g) Results of Melt analysis.
- h) Results of Hardness test.
- i) Results of Hydrostatic test / NDT.
- j) Results of Flaring test.

11.0 PACKING AND MARKING :**11.1 Marking :** The following details shall be marked on each tube.

- a) BHEL Order No.
- b) BHEL Specification No. HY 10790 Rev.02
- c) ASTM: A 269, TP 304-Seamless
- d) Size (OD x Thickness x Length)
- e) Melt/Heat No.
- f) Supplier's Name



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11.2 Packing : Tubes of same size shall be wrapped with a polyethylene sheet to avoid movements and rubbing and packed in wooden boxes. The ends shall be covered with suitable plastic end covers.

Each box shall be of convenient weight for easy handling. The weight of each case shall not exceed 1000 kg (gross). Special lifting tackles, such as, I beams shall be provided with each case and sufficient stiffening shall be provided at the slinging locations. The bottom of the case shall be rigid to enable the tubes to maintain straightness. The method of packing and details of lifting tackles, if any, shall be submitted to BHEL for approval.

12.0 REJECTION AND REPLACEMENT :

In the event of any material proving defective during the course of further processing or testing, such material shall be rejected and the supplier shall make immediate arrangements to replace the same free of cost.



AMENDMENT - NOTIFICATION

HY 10498 REV.NO.00

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**CARBON STEEL PRESSURE VESSEL PLATES FOR
LOW AND MODERATE TEMPERATURE SERVICE
(ORDERING DESCRIPTION FOR ASME: SA516, GR.70)**

Clause: 5.0

Delete the following sentence.

“However, for plates over 5000 mmmechanical properties .”

REF: Brought in line with
SA516 Gr. 70

Amd. No.
01

APPROVED
DGM (P,T&I
SERVICES)

ISSUED
STDS.
ENGG.

DATE
8.7.98

CUM. Sr.No.
A 0251



PLANT PURCHASING SPECIFICATION HYDERABAD

HY 10197

REV. NO: 02

PAGE 1 OF 3

COLD-FORMED SEAMLESS CARBON STEEL STRUCTURAL TUBING

1.0 GENERAL:

This specification governs the requirements of cold formed seamless carbon steel structural tubing to ASTM: A500, Gr.B.

2.0 APPLICATION:

The structural tubing of rectangular and square cross sections, used in the fabrication of Mast and Sub-structures of Oil Rigs.

3.0 COMPLIANCE WITH STANDARDS:

The tubing shall conform to the latest version of ASTM: A500, Gr. B, and with the following additional requirements.

4.0 DIMENSIONS AND TOLERANCES:

4.1 Sizes: The sizes (Outside dimensions and nominal and nominal wall thickness) of the tubes shall be as specified in the purchase order.

Unless otherwise stated, the tubes shall be supplied in lengths of 20' (6.096 m) or 40' (12.192 m) as indicated in the purchase order.

4.2 Tolerances: Shall be as per ASTM: A500 (Latest).

5.0 MANUFACTURE:

The tubes shall be manufactured by seamless process.

6.0 END CONDITION:

The ends of the structural tubes shall be square cut and burrs shall be removed on both outside and inside.

7.0 CHEMICAL ANALYSIS:

The chemical composition of the material shall be as follows:

Revisions: Revised in line with ASTM A 500 – 99.			Issued : STANDARDS ENGINEERING DEPARTMENT		
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PLANT PURCHASING SPECIFICATION HYDERABAD



Element (%)		C	P	S	Cu
Ladle Analysis	Min.	-	-	-	0.20
	Max.	0.26	0.035	0.035	-
Permissible variation in product analysis		+0.04	+0.01	+0.01	-0.02

8.0 MECHANICAL PROPERTIES:

The mechanical properties of the square and rectangular pipes shall be as follows:

Tensile Strength min. N/mm ²	Yield Strength min. N/mm ²	Elongation % min. L=50mm
400	317	23

NOTE: 1) The elongation value applies to tubes with wall thickness 4.57 mm (0.180") and over. For wall thicknesses under 0.180" (4.57 mm), the minimum elongation shall be calculated by the formula. Elongation % min. $L=2''$ (50.8 mm) = $61t+12$. Where t = nominal wall thickness of tubing in inches.

2) Tensile testing shall be done as per ASTM A 370 or any other reputed national/international standard.

9.0 TEST SAMPLES:

9.1 For Chemical Analysis: One sample per melt shall be taken for chemical analysis.

9.2 For Mechanical tests:

9.2.1 One tension test as specified in clause 8.0 shall be made from a length of tubing representing each lot.

9.2.2 The term 'lot' shall apply to all tubes of the same nominal size and wall thickness that are produced from the same heat of steel.

10.0 INSPECTION AT SUPPLIER'S WORKS:

The representative of BHEL shall have free access to the supplier's works at all times during the execution of the order, to satisfy himself that the material is produced as per the quality requirements of this specification. All reasonable facilities shall be extended to him, free of charge. He may also witness the sampling, testing and marking called for in this specification.



**PLANT PURCHASING
SPECIFICATION
HYDERABAD**

HY 10197

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11.0 RETEST:

If the results of the mechanical tests representing any lot fail to conform the requirements of clause 8.0, then the lot can be retested using additional tubing of double the original number from the same lot.

The lot shall be acceptable if each of the sample confirm to the specified requirements during retest. The tubing shall be rejected if it fails to meet the retest requirement.

12.0 TEST CERTIFICATE:

12.1 Five copies of the test certificate with the following details shall be furnished.

- a) BHEL Order No.
- b) BHEL Specification No. HY 10197 / Rev.02
- c) ASTM reference: ASTM A500 Gr.B
- d) Melt No.
- e) Consignment/Identification No.
- f) Results of Product analysis.
- g) Results of Mechanical tests.

12.2 The test certificate shall be signed by the chief of Quality/Chief metallurgist of the supplier and BHEL representative.

13.0 MARKING:

The following details shall be punched at one end of the tubes and encircled by paint.

- a) Melt No.
- b) Supplier's mark

In addition to the above, the following details shall also be marked on each tube.

- c) BHEL Order No.
- d) HY 10197 Rev.02
- e) ASTM: A500, Gr.B
- f) Size & Length
- g) Weight
- h) Consignment/Identification No.

14.0 REJECTION & REPLACEMENT:

In the event of the material proving defective in the course of further processing at BHEL, the same shall be rejected notwithstanding any previous acceptance.

The supplier shall replace the material at his own cost and the rejected material shall be returned after all the commercial conditions are satisfied.

TD-215
Rev.00**AMENDMENT-NOTIFICATION****HY10193****REV.No.02****PAGE 1 OF 1****COLD DRAWN SEAMLESS STEEL PRECISION TUBES**
(355 N/mm² Yield Strength)**Clause 9.0 CHEMICAL COMPOSITION:**

1. Following row shall be added at the end of chemical composition table.

Permissible variation in product analysis (%)	C	Si	Mn	P	S
	+ 0.02	+ 0.03	+ 0.06	+0.005	+ 0.005

2. The existing matter at the end of chemical composition table shall become "note (1)".
3. Following shall be added as "note (2)".

Note (2) : The elements Nb, Ti and V, if added, shall have following permitted deviation in product analysis.

Nb	Ti	V
+ 0.01%	+ 0.01%	+ 0.02%

REF:

Updated in line with DIN 2391 : 1994.

AMD.NO.

01

APPROVED

MANAGER,
STDS. ENGG.

ISSUED

STDS.
ENGG.

DATE

05.09.2001

CUM. Sl.No.

A 0345



**PLANT PURCHASING
SPECIFICATION
HYDERABAD**

HY 10193

Rev. No.02

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COLD DRAWN SEAMLESS PRECISION STEEL TUBES
(355 N/mm² Yield Strength)

1.0 SCOPE:

This specification governs the requirements of Cold drawn seamless precision steel tubes with minimum yield strength of 355 N/mm².

2.0 APPLICATION :

For the manufacture of Switch gear components requiring high yield strength, close dimensional tolerance and good weldability.

3.0 COMPLIANCE WITH STANDARDS :

This specification complies with DIN:2391-1994, Part 1 & Part 2 Gr.S355 GT (Previous Grade.St 52).

4.0 CONDITION OF DELIVERY:

Normalized (NBK) and Quality Grade : C

5.0 DIMENSIONS AND TOLERANCES :

5.1 Dimensions: The tubes shall be supplied to the dimensions specified in the order. Unless otherwise specified, tubes shall be supplied in random lengths of 4 to 6 metres.

5.2 Tolerances:

5.2.1 The tolerances on outside diameter and thickness shall be as per DIN : 2391 part 1, as applicable to normalized tubes.

5.2.2 The computed tolerance values for the sizes of tubes normally procured are given below for ready reference.

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Dt. Mar. 98

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Size OD x Tk (mm)	Tolerance on OD (mm)	Tolerance on Tk (mm)
42 x 2	±0.3	±0.3
45 x 4	±0.2	±0.4
45 x 9	±0.2	±0.9
50 x 2	±0.3	±0.2
80 x 3	±0.5	±0.3

5.2.3 The tolerance on straightness shall be 0.25% of the length.

6.0 MANUFACTURE :

The tubes shall be manufactured from open hearth steel, electric steel or basic oxygen steel. The steel shall be killed and no rimmed steel is acceptable.

7.0 FREEDOM FROM DEFECTS:

Tubes shall be free from scale, scabs, laps and laminations. Tubes shall be reasonably straight and free from cracks and surface defects. The ends shall be cut clean and square with the axis of the tube.

8.0 APPEARANCE:

Tubes shall have a smooth internal and external surface consistent with the cold working process. As a result, the arithmetical mean deviation of the profile, Ra will be 6.3 µm or less.

Other aspects, in general, shall be as per DIN:2391-1994.

9.0 CHEMICAL COMPOSITION:

Element		C	Si	Mn	P	S
Ladle Analysis	Min	--	-	--	-	-
	Max	0.22	0.55	1.60	0.025	0.025

The following alloying elements may be added.

$Nb \leq 0.03\%$, $Ti \leq 0.03\%$, $V \leq 0.05\%$ & $Nb+Ti+V \leq 0.05\%$

10.0 TEST SAMPLES:

10.1 For Chemical Analysis : One sample per melt shall be taken for Chemical analysis.



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HY 10193

Rev. No.02

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10.2 For Mechanical Tests:

10.2.1 Tubes of the same size, melt and heat treat batch shall be divided into batches of 200 Nos. or less.

10.2.2 One tube from each batch shall be picked at random and a longitudinal specimen shall be taken.

11.0 MECHANICAL PROPERTIES

11.1 Tensile: The material shall comply with the following Mechanical properties:

Tensile Strength N/mm ²	Upper Yield Point, min N/mm ²	Elongation L=5d % min
490 -- 630	355	22

12.0 RETESTS:

12.1 If, the selected tube fails during testing, it must be removed from the batch and two other tubes from the same batch shall be taken and the tests shall be repeated.

12.2 If failure occurs in either of the re-tests, the entire batch shall be rejected.

12.3 If necessary, the tubes may be re-heat treated before re-tests.

13.0 TEST CERTIFICATE:

Three copies of the test certificate bearing the following information shall be submitted.

BHEL Order No.

BHEL Specification No. HY 10193 / Rev.02

Manufacturer's Name

Melt/cast No.


Heat Treatment details and batch No.

Results of Chemical analysis.

Results of Mechanical tests.

14.0 MARKING , PRESERVATION AND PACKING:

14.1 Marking: A lable bearing the following details shall be fixed firmly to each bundle/crate carrying the tubes.

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BHEL Order No.
BHEL Specification No. HY 10193 /Rev.02
Consignment / Identification No.
Size and Weight
Supplier's Name / Trade Mark.

14.2 PRESERVATION: All tubes shall be applied with a suitable temporary corrosion protection coating which lasts for one year of outside storage and which can be removed easily by pickling or solvent application. Tube ends shall be suitably capped.

14.3 PACKING: The tubes shall be suitably packed in bundles/crates to prevent corrosion and damage during transit.



PLANT PURCHASING SPECIFICATION

HY 10192

Rev. No.02

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COLD DRAWN SEAMLESS STEEL PRECISION TUBES

(235 N/mm² Yield Strength)

1.0 SCOPE:

This specification governs the requirements of cold drawn seamless steel precision tubes with minimum yield strength of 235 N/mm²

2.0 APPLICATION :

For use in the hydraulics of Switchgear, requiring bending and flaring.

3.0 COMPLIANCE WITH NATIONAL STANDARD :

This specification complies with DIN:2391-1994, Gr.S235 G2T (Previous Gr.St 35 (NBK).

4.0 CONDITION OF DELIVERY:

Normalized (NBK)
Quality Grade : C

5.0 DIMENSIONS AND TOLERANCES :

5.1 Dimensions: The tubes shall be supplied to the sizes (OD x thickness) specified on the Purchase Order.

Unless otherwise specified, tubes shall be supplied in random lengths of 4 to 6 metres.

5.2 Tolerances:

5.2.1 The tolerances on outside diameter and thickness shall be as per DIN : 2391 part I, as applicable to normalized tubes.

5.2.2 The computed tolerance values for the sizes generally procured are given for general information.

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Dt.

Year:

Standards

AGM (G)

JAN. 83

PLANT PURCHASING SPECIFICATION



Size OD X Tk (mm)	Tolerance on OD (mm)	Tolerance on Tk (mm)
25 x 4.0	± 0.08	± 0.40
28 x 1.5	± 0.08	± 0.15
38 x 5.0	± 0.15	± 0.50
42.4 x 5.6	± 0.20	± 0.56
57 x 2.9	± 0.25	± 0.29
70 x 5.0	± 0.30	± 0.50

5.2.3 The tolerance on straightness shall be 0.25% of the length.

6.0 MANUFACTURE :

The tubes shall be manufactured from open hearth steel, electric steel or basic oxygen steel. The steel shall be killed and no rimmed steel is acceptable.

7.0 FREEDOM FROM DEFECTS:

Tubes shall be free from scale, scabs, laps and laminations. Tubes shall be reasonably straight and free from cracks and surface defects. The ends shall be cut clean and square with the axis of the tube.

8.0 APPEARANCE:

Tubes shall have a smooth internal and external surface consistent with the cold working process. As a result, the arithmetical mean deviation of the profile, Ra will be 6.3µm or less.

Other aspects, in general, shall be as per DIN 2391-1994.

9.0 CHEMICAL COMPOSITION:

Element		C	Si	Mn	P	S
Melt Analysis	Min	--	-	0.40	-	-
	Max	0.17	0.35	--	0.025	0.025

The following alloying elements may be added.

Nb≤0.03%, Ti≤0.03%, V≤ 0.05% & Nb+Ti+V≤0.05%

10.0 TEST SAMPLES:

10.1 For Chemical Analysis : One sample per melt shall be taken for Chemical analysis.



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HY 10192

Rev. No.02

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10.2 For Mechanical Tests:

10.2.1 Tubes of the same size, melt and heat treatment shall be divided into batches of 200 Nos. or less.

10.2.2 One tube from each batch shall be picked at random and a longitudinal specimen shall be taken.

11.0 MECHANICAL PROPERTIES

11.1 Tensile: The material shall comply with the following tensile properties:

Tensile Strength N/mm ²	Upper Yield Point, min N/mm ²	Elongation l = 5 d % min
340 - 470	235	25

11.2 Flattening Test: One sample per lot shall be subjected to flattening test as per DIN : 2391.

11.3 Drift Expanding Test: One sample per lot shall be subjected to Drift expanding Test as per DIN : 2391, upto the expansion specified below.

Expansion in %	
TK ≤ mm	TK > 4 mm
18	12

12.0 RETESTS:

12.1 If, the selected tube fails during testing, it must be removed from the batch and two other tubes from the same batch shall be taken and the tests shall be repeated.

12.2 If failure occurs in either of the re-tests, the entire batch shall be rejected.

12.3 If necessary, the tubes may be re-heat treated before re-tests.


13.0 TEST CERTIFICATE:

Three copies of the test certificate bearing the following information shall be submitted.

BHEL Order No.

BHEL Specification No. HY 10192 / Rev.02

Manufacturer's Name

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Melt/cast No.
Heat Treatment details and batch No.
Results of Chemical analysis.
Results of Mechanical tests.

14.0 MARKING PRESERVATION AND PACKING:

14.1 Marking: A lable bearing the following details shall be fixed firmly to each bundle/crate carrying the tubes.

BHEL Order No.
BHEL Specification No. HY 10192 / Rev.02
Consignment / Identification No.
Size and Weight
Supplier’s Name / Trade Mark.

14.2 Preservation: All tubes shall be applied with a suitable temporary corrosion protection coating which lasts for one year of outside storage and which can be removed easily by pickling or solvent application. Tube ends shall be suitably capped.

14.3 Packing: The tubes shall be suitably packed in bundles/crates to prevent corrosion and damage during transit.



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	2,3,4 & 5 only to	3, 4, & 7 to be hard
2.	Marker's emblem	on aluminium metal	be paint stenciled	stamped on the
3.	Specn.No.& grade	tag and securely	on each tube.	body of pipes 2, 5
4.	Melt Number	attached to each	1 to 7 to be stamped	and 7 to be paint
5.	Size (OD X TK X length)	bundle	on aluminium metal	stenciled on the
6.	No. of tubes/pipes		tag and securely	pipes. (Alternatively
7.	Inspector's seal		attached to each	paint stenciled is
			bundle.	permitted on mutual
				agreement for 3, 4
				& 7 only)

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

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AA 049 00 01	CORPORATE STANDARD	
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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



CORPORATE STANDARD

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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	-	-



CORPORATE PURCHASING SPECIFICATION

AA 107 55

Rev. No. 07

PREFACE SHEET

SEAMLESS STAINLESS STEEL PIPES (AUSTENITIC, Ti STABILIZED) (ASTM A 312, TP 321)

FOR INTERNAL USE ONLY
REMOVE THIS PREFACE SHEET BEFORE ISSUE TO SUPPLIERS

Comparable Standards:

- | | | |
|-------------|---|-------------------------------------|
| 1. AMERICAN | : | ASTM A 312
Gr.: S 32100 (TP 321) |
| 2. EUROPEAN | : | DIN 17458, Gr:X6CrNiTi18-10. |

Suggested/Probable Suppliers And Grades:

Refer Plant Vendors list

User Plant References:

- | | | |
|-------------------|---|----------------------------------|
| 1. HEEP - HARDWAR | : | HW 021 02 99 |
| 2. BHOPAL | : | PS 105 29 |
| 3. HYDERABAD | : | AISI 321, ASTM A 312, Gr.:TP 321 |
| 4. TIRUCHY | : | ASTM A 312, Gr.: TP 321 |

Revisions :
CI 27.6.27 of MOM of MRC-S&GPS

APPROVED :
INTERPLANT MATERIAL
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CORPORATE PURCHASING SPECIFICATION

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Rev. No. 07

PAGE 1 OF 2

SEAMLESS STAINLESS STEEL PIPES (AUSTENITIC, Ti STABILIZED) (ASTM A 312, TP 321)

ORDERING DESCRIPTION FOR ASTM A 312, TP 321

1.0 GENERAL:

The pipes shall conform to the latest version for ASTM A 312, TP 321 and comply with the following additional requirements.

2.0 APPLICATION

For corrosion resistant applications.

3.0 DIMENSIONS AND TOLERANCES:

3.1 Sizes:

Pipe outside diameter and wall thickness shall be as specified in BHEL order. Unless otherwise specified, pipes shall be supplied in lengths of not less than 4.5 metres.

3.2 TOLERANCES:

As per ASTM A 999.

4.0 MANUFACTURE:

Either hot finished or cold drawn.

5.0 CHEMICAL COMPOSITION:

As per ASTM A 312, TP 321.

6.0 MECHANICAL PROPERTIES:

As per ASTM A 312 TP 321.

7.0 HYDROSTATIC TEST / NDT:

Each length of pipe shall be subjected to Hydrostatic test as per ASME SA 530.

As an alternative to the Hydrostatic test, each length of pipe shall be subjected to NDT as given below:

a) For thickness upto 3.6mm, inclusive, Eddy current test as per ASME SE 309 or for thickness upto 12mm, inclusive, Flux leakage test as per ASME SE 570.

or

b) Ultrasonic test as per ASME SE 213.

Norms of acceptance shall be as specified in the respective standards mentioned above.

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JUNE, 1978

**8.0 INSPECTION AT SUPPLIER'S WORKS:**

BHEL's representative shall have free access at all times to all parts of the manufacture's works, until the work on the contract of BHEL is being performed. The manufacturer shall offer BHEL's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with the specification.

9.0 REPAIRS:

9.1 Repair involving fusion welding is prohibited.

9.2 When defects are repaired by mechanical means, the wall thickness requirements shall be satisfactorily met with and the surfaces shall be smoothly dressed up without any sharp edges.

10.0 CERTIFICATION:

Test certificate shall be as per ASTM A 999.

11.0 PACKING AND MARKING:

As per BHEL Standard AA 049 00 01.

12.0 REJECTION AND REPLACEMENT:


If each length of pipe does not comply with the requirements of this specification during receipt inspection at BHEL or if any defect is found during further processing of pipes BHEL reserves the right to reject the whole consignment and the supplier shall replace the material free of cost. The rejected material shall be taken back by the supplier after fulfilling the commercial terms and conditions.

FOR INFORMATION ONLY**CHEMICAL COMPOSITION**

C	Si	Mn	Ni	Cr	S	P	Ti	N
≤ 0.08	≤ 1.0	≤ 2.0	9.0-12.0	17.0-19.0	≤ 0.030	≤ 0.045	5XC - 0.70	≤ 0.10

MECHANICAL PROPERTIES

Wall Thickness	0.2% PS min N/mm ²	UTS min N/mm ²	% El min	
			Longitudinal	Transverse
≤ 9.52 cm	205	515	35	25
> 9.52 cm	170	415	35	25

	CORPORATE PURCHASING SPECIFICATION			AA 106 34	
				Rev. No. 04	
				PAGE 1 OF 2	
SEAMLESS FERRITIC ALLOY STEEL PIPES (Gr:P 91) FOR HIGH TEMPERATURE SERVICE ORDERING DESCRIPTION FOR ASME SA 335 Gr: P 91					
1.0 GENERAL The pipes shall conform to the latest version for ASME SA 335, Gr:P 91 and comply with the following additional requirements.					
2.0 APPLICATION For high temperature service at stress levels and temperatures allowed by ASME Boiler & Pressure Vessel Code, Section I & Indian Boiler Regulations.					
3.0 CONDITION OF MANUFACTURING ↑ Either hot finished seamless or cold drawn seamless, plain ends, unless other wise specified on BHEL order.					
4.0 DIMENSIONS & TOLERANCES ↑					
4.1 Sizes Pipe OD X thickness shall be as specified in the order. Unless otherwise specified, pipes shall be supplied in single random lengths of 5 to 7 metres.					
4.2 Tolerances On outside diameter : $\pm 1\%$ Other tolerances : As per ASME SA 530					
5.0 HYDROSTATIC TEST / NDT Each length of pipe shall be subjected to Hydrostatic test as per ASME SA 530. As an alternative to the Hydrostatic test, each length of pipe shall be subjected to NDT as given below: <ul style="list-style-type: none"> a) For thickness upto 3.6mm, inclusive, Eddy current test as per ASME SE 309 or for thickness upto 12mm, inclusive Flux leakage test. <p style="text-align: center;">or</p> <ul style="list-style-type: none"> b) Ultrasonic test as per ASME SE 213. Norms of acceptance shall be as specified in the respective standards mentioned above.					
Revisions: Cl: 31.7.6 of MOM of MRC-FCF+HTM			APPROVED : INTERPLANT MATERIAL RATIONALISATION COMMITTEE-MRC (FCF+HTM)		
Rev. No. 04	Amd.No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue
Dt: 25.05.2007	Dt :	Year :	HYDERABAD	Corp. R&D	February, 2001

**6.0 INSPECTION AT SUPPLIER'S WORKS**

BHEL's representative shall have free access at all times to all parts of the manufacture's works, until the work on the contract of BHEL is being performed. The manufacturer shall offer BHEL's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with the specification.

7.0 REPAIRS

7.1 Fusion welding is prohibited.

7.2 When done by mechanical means, the wall thickness is to be met with and the surfaces to be smoothly dressed up from any sharp edges.

8.0 CERTIFICATION

Test certificate shall be provided as per IBR FORM-III D issued by WELL KNOWN PIPE MAKER who is recognised by Central Boiler Board. Copy of certification of recognition as Well Known Pipe Maker in FORM XVI - G shall also be enclosed along with the test certificate.

9.0 PACKING AND MARKING

As per BHEL Corporate Standard AA 049 00 01.

10.0 REJECTION AND REPLACEMENT

If each length of pipe does not comply with the requirements of this specification during receipt inspection at BHEL or if any defect is found during further processing of pipes BHEL reserves the right to reject the whole consignment and the supplier shall replace the material free of cost. The rejected material shall be taken back by the supplier after fulfilling the commercial terms and conditions.



CORPORATE PURCHASING SPECIFICATION

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Rev. No. 06

PAGE 1 OF 2

SEAMLESS FERRITIC ALLOY STEEL PIPES (Gr:P 11) FOR HIGH TEMPERATURE SERVICE

ORDERING DESCRIPTION FOR ASME SA 335, P 11

1.0 GENERAL:

The pipes shall conform to the latest version for ASME SA 335, Gr: P 11, and comply with the following additional requirements.

2.0 APPLICATION:

For high temperature service at stress levels and temperatures allowed by ASME Boiler & Pressure Vessel Code, Section I & Indian Boiler Regulations.

3.0 CONDITION OF DELIVERY:

Either hot finished seamless or cold drawn seamless, plain ends, unless other wise specified on BHEL order.

4.0 DIMENSIONS AND TOLERANCES:

4.1 Sizes:

Pipe OD X Thickness shall be as specified in BHEL order. Unless other wise specified, pipes shall be supplied in single random lengths of 5 to 7 metres.

4.2 Tolerances:

On outside diameter : $\pm 1\%$

Other tolerances : As per ASME SA 530

5.0 HYDROSTATIC TEST / NDT:

Each length of pipe shall be subjected to Hydrostatic test as per ASME SA 530.

As an alternative to the Hydrostatic test, each length of pipe shall be subjected to NDT as given below:

- a) For thickness upto 3.6mm, inclusive, Eddy current test as per ASME SE 309 or for thickness upto 12mm, inclusive Flux leakage test.

or

- b) Ultrasonic test as per ASME SE 213.

Norms of acceptance shall be as specified in the respective standards mentioned above.

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**6.0 INSPECTION AT SUPPLIER'S WORKS:**

BHEL's representative shall have free access at all times to all parts of the manufacture's works, until the work on the contract of BHEL is being performed. The manufacturer shall offer BHEL's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with the specification.

7.0 REPAIRS:

Fusion welding is prohibited.

When done by mechanical means, the wall thickness is to be met with and the surfaces to be smoothly dressed up from any sharp edges.

8.0 CERTIFICATION:

Test certificate shall be provided as per IBR FORM-III D issued by WELL KNOWN PIPE MAKER who is recognised by Central Boiler Board. Copy of certification of recognition as Well Known Pipe Maker in FORM XVI - G shall also be enclosed along with the test certificate.

Note: In lieu of IBR form III-D, the manufacturer can also submit test certificate in IBR form III-A duly inspected by IBR approved agency with prior written permission from BHEL."

9.0 PACKING AND MARKING:

As per BHEL Standard AA 049 00 01.

10.0 REJECTION AND REPLACEMENT:

If each length of pipe does not comply with the requirements of this specification during receipt inspection at BHEL or if any defect is found during further processing of pipes BHEL reserves the right to reject the whole consignment and the supplier shall replace the material free of cost. The rejected material shall be taken back by the supplier after fulfilling the commercial terms and conditions.



CORPORATE PURCHASING SPECIFICATION

AA 106 30

Rev. No. 10

PAGE 1 OF 2

SEAMLESS FERRITIC ALLOY STEEL PIPES (Gr: P 22) FOR HIGH TEMPERATURE SERVICE

ORDERING DESCRIPTION FOR ASME SA 335, P 22

1.0 GENERAL:

The pipes shall conform to the latest version for ASME SA 335, Gr:P 22 and comply with the following additional requirements.

2.0 APPLICATION:

For high temperature service at stress levels and temperatures allowed by ASME Boiler & Pressure Vessel Code, Section I & Indian Boiler Regulations.

3.0 CONDITION OF MANUFACTURING:

Either hot finished or cold drawn, plain ends, unless other wise specified in BHEL order. ↑

4.0 TOLERANCES:

On outside diameter : $\pm 1\%$
Other tolerances : As per ASME SA 530.

5.0 HYDROSTATIC TEST / NDT:

Each length of pipe shall be subjected to Hydrostatic test as per ASME SA 530.

As an alternative to the Hydrostatic test, each length of pipe shall be subjected to NDT as given below:

- a) For thickness upto 3.6mm, inclusive, Eddy current test as per ASME SE 309 or for thickness upto 12mm, inclusive Flux leakage test can also be conducted as per ASME SE 570.

or

- b) Ultrasonic test as per ASME SE 213.

Norms of acceptance shall be as specified in the respective standards mentioned above.

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**6.0 INSPECTION AT SUPPLIER'S WORKS**

BHEL's representative shall have free access at all times to all parts of the manufacture's works, until the work on the contract of BHEL is being performed. The manufacturer shall offer BHEL's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with the specification.

7.0 REPAIRS

7.1 Repairs involving fusion welding is prohibited.

7.2 When defects are repaired by mechanical means, the wall thickness requirements shall be satisfactorily met with and the surfaces shall be smoothly dressed up without any sharp edges.

8.0 CERTIFICATION

Test certificate shall be provided as per IBR FORM-III D issued by WELL KNOWN PIPE MAKER who is recognised by Central Boiler Board. Copy of certification of recognition as Well Known Pipe Maker in FORM XVI - G shall also be enclosed along with the test certificate.

Note: In lieu of IBR form III-D, the manufacturer can also submit test certificate in IBR form III-A duly inspected by IBR approved agency with prior written permission from BHEL."

9.0 PACKING AND MARKING

As per BHEL Standard AA 049 00 01.

10.0 REJECTION AND REPLACEMENT

If each length of pipe does not comply with the requirements of this specification during receipt inspection at BHEL or if any defect is found during further processing of pipes BHEL reserves the right to reject the whole consignment and the supplier shall replace the material free of cost. The rejected material shall be taken back by the supplier after fulfilling the commercial terms and conditions.



CORPORATE PURCHASING SPECIFICATION

AA 104 55

Rev. No. 09

PAGE 1 OF 2

CARBON STEEL SEAMLESS PIPES FOR HIGH TEMPERATURE SERVICE

ORDERING DESCRIPTION FOR ASME SA 106, Gr.: B

1.0 GENERAL:

The pipes shall conform to the latest version for ASME SA 106, Gr:B and comply with the following additional requirements.

2.0 APPLICATION

For high temperature service at stress levels and temperatures allowed by ASME Boiler & Pressure Vessel Code, Section I & Indian Boiler Regulations.

3.0 DIMENSIONS AND TOLERANCES:

3.1 Sizes:

Pipe OD X Thickness shall be as specified on BHEL order. Unless otherwise specified, pipes shall be supplied in single random lengths of 4.8 to 6.7 metres.

3.2 TOLERANCES:

As per ASME SA 530.

4.0 MANUFACTURE:

Either hot finished or cold drawn.

5.0 CHEMICAL COMPOSITION:

Carbon content shall be restricted to 0.25% , max.

6.0 MECHANICAL PROPERTIES:

6.1 Bend Test:

One pipe per melt/size upto 60.3 mm OD (nominal size) shall be subjected to bend test as per ASME SA 106.

6.2 Flattening:

One pipe per melt / size over 60.3 mm OD (nominal size) shall be subjected to flattening test at one end of the pipe as per ASME SA 106.

For pipes of sizes 10 inches and above (≥ 254 mm) may be bend tested as per ASME SA 106.

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**7.0 HYDROSTATIC TEST / NDT:**

Each length of pipe shall be subjected to Hydrostatic test as per ASME SA 530.

As an alternative to the Hydrostatic test, each length of pipe shall be subjected to NDT as given below:

- a) For thickness upto 3.6mm, inclusive, Eddy current test as per ASME SE 309 or for thickness upto 12mm, inclusive, Flux leakage test as per ASME SE 570.
or
- b) Ultrasonic test as per ASME SE 213.

Norms of acceptance shall be as specified in the respective standards mentioned above.

8.0 INSPECTION AT SUPPLIER'S WORKS:

BHEL's representative shall have free access at all times to all parts of the manufacture's works, until the work on the contract of BHEL is being performed. The manufacturer shall offer BHEL's representative all reasonable facilities, without charge, to satisfy the latter that the material is being furnished in accordance with the specification.

9.0 REPAIRS:

9.1 Repair involving fusion welding is prohibited.

9.2 When defects are repaired by mechanical means, the wall thickness requirements shall be satisfactorily met with and the surfaces shall be smoothly dressed up without any sharp edges.

10.0 CERTIFICATION:

Test certificate shall be provided as per IBR FORM-III D issued by WELL KNOWN PIPE MAKER who is recognised by Central Boiler Board. Copy of certification of recognition as Well Known Pipe Maker in FORM XVI - G shall also be enclosed along with the test certificate.

Note: In lieu of IBR form III-D, the manufacturer can also submit test certificate in IBR form III-A duly inspected by IBR approved agency with prior written permission from BHEL."

11.0 PACKING AND MARKING:

As per BHEL Standard AA 049 00 01.

12.0 REJECTION AND REPLACEMENT:

If each length of pipe does not comply with the requirements of this specification during receipt inspection at BHEL or if any defect is found during further processing of pipes BHEL reserves the right to reject the whole consignment and the supplier shall replace the material free of cost. The rejected material shall be taken back by the supplier after fulfilling the commercial terms and conditions.



PLANT PURCHASING SPECIFICATION

HY 10793

REV. No: 01

PAGE 1 OF 4

SEAMLESS STAINLESS STEEL TUBES (AUSTENITIC, 304 L GRADE)

1. GENERAL :

This specification governs the quality of Seamless Stainless Steel Tubes (Austenitic, 304 L Grade).

2.0 APPLICATION :

For general corrosion resistant applications.

3.0 CONDITION OF DELIVERY :

Seamless and heat treated.

4.0 COMPLIANCE WITH NATIONAL STANDARDS :

The material shall comply with the requirements of :

ASTM A269-1996
Gr. TP 304 L
seamless

Seamless and Welded Austenitic Stainless
Steel Tubing for General Service.

5.0 DIMENSIONS AND TOLERANCES :

5.1 Sizes : Our order shall clearly state outside diameter and wall thickness of the tube.

Tubes shall be supplied in lengths of not less than 4.5 metres unless exact lengths are called for in the order.

5.2 Tolerances : Tubes shall comply with the dimensional tolerances as specified in ASTM A 269

5.3 MANUFACTURE :

The steel shall be made by the electric or such other process as may be agreed to between the purchaser and supplier.

Tubes shall be made by the seamless process. Tubes may be either hot finished or cold finished.

Revisions:

Brought in line with latest ASTM
Standard.

ISSUED :

**STANDARDS ENGINEERING
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Dt.

Year:

Matls. Engg.

Sr. DGM (E&CC)

NOV.90

PLANT PURCHASING SPECIFICATION



Sufficient discard shall be made from each ingot to ensure freedom from piping and undue segregation.

Joints are not permitted.

7.0 FREEDOM FROM DEFECTS :

The finished tubes shall be straight and free from injurious defects and shall have a workman like finish.

8.0 HEAT TREATMENT :

The tubes shall be supplied in heat treated condition. The heat treatment procedure shall consist of heating the tube to a minimum temperature of 1,040⁰C and quenching in water or rapidly cooling by other means.

9.0 CHEMICAL COMPOSITION :

The analysis of the material shall be as follows :

Element	Percent	
	Min.	Max.
Carbon	-	0.035
Silicon	-	0.75
Manganese	-	2.00
Nickel	8.00	13.00
Chromium	18.00	20.00
Sulphur	-	0.03
Phosphorus	-	0.04

10.0 TEST SAMPLES :

10.1 For Chemical Analysis : One sample shall be selected from each heat.

10.2 For Hardness Test : Two nos. of tubes per lot shall be hardness tested as per A 269.

10.3 Flaring Test : One test shall be made on specimens from one end of one tube from each lot of finished tubes.

10.4 For Hydro Test / Non-destructive Test: Each length of finished tube shall be subjected to Hydro test or Non-destructive test.



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11.0 MECHANICAL PROPERTIES :

11.1 Hardness : Hardness shall not be more than 192HB or 90 HRB.

11.2 Flaring Test : Shall be conducted as specified in ASTM A 450 and shall meet the requirements specified therein.

12.0 HYDROSTATIC OR NON-DESTRUCTIVE ELECTRIC TEST :

Hydrostatic test shall be conducted as specified in ASTM A 450 and shall meet the requirements specified therein. Minimum hydrostatic test pressure shall be 1500 PSI even for the size under 25.4 mm (1 inch).

As an alternative to the Hydrostatic test, each length of the tube having wall thickness of 3.6 mm including & below shall be subjected to Eddy current test and tubes having wall thickness of more than 3.6 mm shall be subjected to Ultrasonic test as per BHEL Standard AA 0850144. Norms of acceptance shall be specified in the respective standards mentioned above.

13.0 INSPECTION AT SUPPLIER'S WORKS :

The representative of BHEL shall have free access to the supplier's works at all times during the execution of the order, to satisfy himself that the material is produced as per the quality requirements of this specification. All reasonable facilities shall be extended to him, free of charge. He may also witness the sampling, testing and marking called for in this specification.

14.0 TEST CERTIFICATE :

Five copies of the test certificate giving the following details shall be furnished.

- a. BHEL Order No.
- b. BHEL Specification No. HY 10793 Rev.01
- c. ASTM A 269, TP 304L
- d. Melt / Heat No.
- e. Size
- f. Heat treatment details and batch No.
- g. Results of Heat & Product analysis.
- h. Results of Hardness test.
- i. Results of Mechanical tests.
- j. Results of Hydrostatic test.
- k. Results of Eddy current / Ultrasonic test.

15.0 PACKING AND MARKING :

15.1 Marking : The following details shall be marked on each tube.

- a. BHEL Order No.
- b. BHEL Specification No. HY 10793 Rev.01
- c. ASTM A 269, TP 304L
- d. Size (OD x Thickness x Length)
- e. Melt / Heat No.
- f. Supplier's Name

15.2 Packing : Tubes of same size shall be wrapped with a polyethylene sheet to avoid movements and rubbing and packed in wooden boxes. The ends shall be covered with suitable plastic end covers.

Each box shall be of convenient weight for easy handling. The weight of each case shall not exceed 1000 Kg. (gross). Special lifting tackles, such as I beams shall be provided with each case and sufficient stiffening shall be provided at the slinging locations. The bottom of the case shall be rigid to enable the tubes to maintain straightness. The method of packing and details of lifting tackles, if any, shall be submitted to BHEL for approval.