An ISO 9001
Company

Bharat Heavy Electricals Limited
(High Pressure Boiler Plant)
Tiruchirappalli – 620014, TAMIL NADU, INDIA
MATERIALS MANAGEMENT

PROCUREMENT OF U TUBES/ PLAIN TUBES AS PER SPECIFICATION INCOLLOY-800 & PB-M-131/Rev.02, AS PER DRAWING 1-93-170-05127/Rev.01 AND AS PER SPECIAL CONDITIONS.	Phone: **+91 431 2577378/2575675** Fax : **+91 431 252 07 19** Email : **mahadev@bheltry.co.in**

	Reference Number: Enquiry 1500900101	**Enquiry Date: 28.12.2009**	**Due date for submission of quotation: 03.02.2010**
You are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order			

Sub: Requirement of additional sources for supply of INCOLOY U TUBES/PLAIN TUBES.

BHEL/Trichy is looking for empanelment of new vendors for supply of tubes as per annexure A.
Kindly note that
1. Material supply/sourcing in any form from Chinese suppliers is not acceptable.
2. Only vendors with prior experience of supply to Nuclear Power Corporation of India Ltd or any other nuclear power station are asked to submit their offers.

BHEL commercial terms & conditions, other additional conditions for submission of offers and all annexure can be downloaded from BHEL web site http://www.bhel.com under enquiry reference "**1500900101** "

Tenders should reach us before 14:00 hours on the due date
Technical bid will be opened at 14:30 hours on the due date
Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present.

Yours faithfully,
For **Bharath Heavy Electricals Limited**

SM / PURCHASE / TUBES / MFG

P.MADHAVA RAJU
DM / PURCHASE / MFG
BHEL / TRICHY-620014

BHARAT HEAVY ELECTRICALS LIMITED

ENQUIRY
(IMPORTS) &
(INDIGENOUS)

(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - FOSSIL BOILERS
THIRUCHIRAPALLI - 620014
TAMILNADU (INDIA)

PHONE : 2577378
GRAMS : BHARATELEC
FAX NO: 2520719
E-mail: mahadev@bheltry.co.in
Web:

Enquiry No	Enquiry Date	Due Date for Quotation
1500900101	28.12.2009	03.02.2010

Please quote Enquiry No, Date and due date in all correspondences.
This is only a request for quotation and not an order

Item	Description	Unit	Quantity	Delivery Schedule Quantity	Delivery Schedule Date
10	D13530101187 Straight Tubes-19 x 1.1 THK	M	1700.000	1,700.00	30.11.10
20	D13530101190 U-TUBE VAR-01	NO	84.000	84.00	30.11.10
30	D13530101191 U-TUBE VAR-02	NO	90.000	90.00	30.11.10
40	D13530101192 U-TUBE VAR-03	NO	88.000	88.00	30.11.10
50	D13530101193 U-TUBE VAR-04	NO	90.000	90.00	30.11.10
60	D13530101194 U-TUBE VAR-05	NO	88.000	88.00	30.11.10
70	D13530101195 U-TUBE VAR-06	NO	90.000	90.00	30.11.10
80	D13530101196 U-TUBE VAR-07	NO	88.000	88.00	30.11.10
90	D13530101197 U-TUBE VAR-08	NO	90.000	90.00	30.11.10
100	D13530101198 U-TUBE VAR-09	NO	88.000	88.00	30.11.10
110	D13530101199 U-TUBE VAR-10	NO	90.000	90.00	30.11.10
120	D13530101200 U-TUBE VAR-11	NO	88.000	88.00	30.11.10
130	D13530101201 U-TUBE VAR-12	NO	88.000	88.00	30.11.10
140	D13530101202 U-TUBE VAR-13	NO	88.000	88.00	30.11.10
150	D13530101203 U-TUBE VAR-14	NO	86.000	86.00	30.11.10
160	D13530101204 U-TUBE VAR-15	NO	88.000	88.00	30.11.10
170	D13530101205 U-TUBE VAR-16	NO	86.000	86.00	30.11.10
180	D13530101206	NO	84.000	84.00	30.11.10

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Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**

MANAGER / PURCHASE
(FOSSIL BOILERS)

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	U-TUBE VAR-17				
190	D13530101207 U-TUBE VAR-18	NO	86.000	86.00	30.11.10
200	D13530101208 U-TUBE VAR-19	NO	84.000	84.00	30.11.10
210	D13530101209 U-TUBE VAR-20	NO	86.000	86.00	30.11.10
220	D13530101210 U-TUBE VAR-21	NO	84.000	84.00	30.11.10
230	D13530101211 U-TUBE VAR-22	NO	86.000	86.00	30.11.10
240	D13530101212 U-TUBE VAR-23	NO	84.000	84.00	30.11.10
250	D13530101213 U-TUBE VAR-24	NO	82.000	82.00	30.11.10
260	D13530101214 U-TUBE VAR-25	NO	84.000	84.00	30.11.10
270	D13530101215 U-TUBE VAR-26	NO	82.000	82.00	30.11.10
280	D13530101216 U-TUBE VAR-27	NO	84.000	84.00	30.11.10
290	D13530101217 U-TUBE VAR-28	NO	82.000	82.00	30.11.10
300	D13530101218 U-TUBE VAR-29	NO	80.000	80.00	30.11.10
310	D13530101219 U-TUBE VAR-30	NO	82.000	82.00	30.11.10
320	D13530101220 U-TUBE VAR-31	NO	80.000	80.00	30.11.10
330	D13530101221 U-TUBE VAR-32	NO	78.000	78.00	30.11.10
340	D13530101222 U-TUBE VAR-33	NO	80.000	80.00	30.11.10
350	D13530101223 U-TUBE VAR-34	NO	78.000	78.00	30.11.10
360	D13530101224 U-TUBE VAR-35	NO	76.000	76.00	30.11.10
370	D13530101225 U-TUBE VAR-36	NO	78.000	78.00	30.11.10
380	D13530101226 U-TUBE VAR-37	NO	76.000	76.00	30.11.10
390	D13530101227 U-TUBE VAR-38	NO	70.000	70.00	30.11.10

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400	D13530101228 U-TUBE VAR-39	NO	76.000	76.00	30.11.10
410	D13530101229 U-TUBE VAR-40	NO	74.000	74.00	30.11.10
420	D13530101230 U-TUBE VAR-41	NO	72.000	72.00	30.11.10
430	D13530101231 U-TUBE VAR-42	NO	70.000	70.00	30.11.10
440	D13530101232 U-TUBE VAR-43	NO	72.000	72.00	30.11.10
450	D13530101233 U-TUBE VAR-44	NO	70.000	70.00	30.11.10
460	D13530101234 U-TUBE VAR-45	NO	68.000	68.00	30.11.10
470	D13530101235 U-TUBE VAR-46	NO	66.000	66.00	30.11.10
480	D13530101236 U-TUBE VAR-47	NO	68.000	68.00	30.11.10
490	D13530101237 U-TUBE VAR-48	NO	66.000	66.00	30.11.10
500	D13530101238 U-TUBE VAR-49	NO	64.000	64.00	30.11.10
510	D13530101239 U-TUBE VAR-50	NO	62.000	62.00	30.11.10
520	D13530101240 U-TUBE VAR-51	NO	64.000	64.00	30.11.10
530	D13530101241 U-TUBE VAR-52	NO	62.000	62.00	30.11.10
540	D13530101242 U-TUBE VAR-53	NO	60.000	60.00	30.11.10
550	D13530101243 U-TUBE VAR-54	NO	58.000	58.00	30.11.10
560	D13530101244 U-TUBE VAR-55	NO	56.000	56.00	30.11.10
570	D13530101245 .U-TUBE VAR-56	NO	54.000	54.00	30.11.10
580	D13530101246 U-TUBE VAR-57	NO	52.000	52.00	30.11.10
590	D13530101247 U-TUBE VAR-58	NO	54.000	54.00	30.11.10
600	D13530101248 U-TUBE VAR-59	NO	52.000	52.00	30.11.10
610	D13530101249 U-TUBE VAR-60	NO	50.000	50.00	30.11.10

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620	D13530101250 U-TUBE VAR-61	NO	48.000	48.00	30.11.10
630	D13530101251 U-TUBE VAR-62	NO	46.000	46.00	30.11.10
640	D13530101252 U-TUBE VAR-63	NO	44.000	44.00	30.11.10
650	D13530101253 U-TUBE VAR-64	NO	42.000	42.00	30.11.10
660	D13530101254 U-TUBE VAR-65	NO	40.000	40.00	30.11.10
670	D13530101255 U-TUBE VAR-66	NO	34.000	34.00	30.11.10
680	D13530101256 U-TUBE VAR-67	NO	32.000	32.00	30.11.10
690	D13530101257 U-TUBE VAR-68	NO	30.000	30.00	30.11.10
700	D13530101258 U-TUBE VAR-69	NO	28.000	28.00	30.11.10
710	D13530101259 U-TUBE VAR-70	NO	22.000	22.00	30.11.10
720	D13530101260 U-TUBE VAR-71	NO	16.000	16.00	30.11.10
730	D13530101261 U-TUBE VAR-72	NO	10.000	10.00	30.11.10

General Note:

1) Tender will be opened as a TWO PART BID. Two separate covers, one for technical details and the other for price bid are to be submitted on or before 03.02.2009 (February 3rd).
2) The date of opening of price bid will be informed later after acceptance of offer on technical ground.
3) Material specification shall be INCOLOY 800 and supplies are to be made as per specification No-PB-M-131/Rev02.
4) Both plain tubes and U tubes are to be supplied as per specification mentioned above.
5) All the U tubes are to be supplied as per drawing 1-93-170-05127 Rev01.
6) Inspection should be done by an authorized inspection agencies. Your offer should indicate the name of the inspection agency.
7)IMPORT vendors requested to quote both on FOB & CFR rate and INDIGENOUS vendors are to quote on Ex-works rate & FOR destination with break-up freight details. Rates quoted should be inclusive of all charges like packing charges and inspection charges. The prices are to be quoted in per meter basis for Straight tubes and per number basis for the U tubes.

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8) The actual production of tube materials is permitted only after review/approval of manufacturing/testing/ Inspection drawings /documents and quality assurance plans (QAP) by BHEL, Tiruchy.
9) Five additional documents containing test certificates, copies of the approved procedures DCR, Drgs etc apart from contractual requirements are required.
10) Confirmation for partial ordering to be indicated in the offer itself.
11)BHEL reserves the right to order as a whole or individual item basis depending upon the requirement of BHEL
12) Offers should be kept valid for minimum 45 days. Extension if required will be requested.
13) We require all these tubes are to be supplied positively before November-2011.
14) Vendors should indicate confirmation of specification, point by point as applicable to the tender. Only Deviation, if any, with respect to specific clause alone should be clearly spelt out in the offer.
15) No.L.C will be opened for indigenous vendors.Payments to indigenous vendors will be made either through Bank or directly after receipt and acceptance of materials at BHEL trichy.

Enclosures:

"LD clause has to be confirmed without fail."

"Payment to vendors will be made only thro E-Payment mode"

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(FOSSIL BOILERS)
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DM/ PURCHASE/ MFG
BHEL/TRICHY-620014

SPECIFICATION

NO.PB-M-131

SEAMLESS, COLD WORKED

INCOLOY 800 TUBINGS FOR HEX

ISSUE

No.	DETAILS	INITIAL	No.OF PAGES	DATE
1.	Original	V. Sharma	16	Nov., 1988.
2.	Rev. 1	V. Sharma	16	July, 1989.
3.	Rev. 2	V. Sharma	16	May, 1990.

File Reference : 33111

V. Sharma.

PREPARED BY : V.K. SHARMA 22.11.88

APPROVED BY : Ch. SURENDAR 23/11/88

Seamless, Incoloy 800 Tubings For HEX

1. SCOPE

This Specification covers the technical requirements for the supply of Seamless Nickel-Iron-Chromium Alloy (Incoloy 800) tubings for Heat Exchangers. All requirements of this specification represent minimum requirements.

2. CONTENTS

The requirements of this specification are presented under following sections:

3. APPLICABLE SPECIFICATIONS

The following codes and standards of the issue in effect on the date of issuing tender document shall form part of this specification. In case of conflict between the Codes/ Standards listed below, with the requirements of this specification, the requirements which are more stringent shall govern.

3.1 Relevant ASTM Standards

3.2 ASME - CW Alloy 800 SB 163 (including Code Case N-20-2) and SB 513

3.3 ASME - Section V, Non Destructive Examination.

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4. MATERIAL, PROCESS OF MANUFACTURE, WORKMANSHIP AND REQUIREMENTS

4.1 Material

The tubing shall comply with ASME-SB-163 Seamless Nickel and Nickel Alloy Condenser and Heat Exchanger Tubes, with particular requirements specified below. The alloy shall be that designated in ASME-SB-163 as UNS No. 8800 with the following restricted chemical composition:

CHEMICAL AND COMPOSITION (Product & Ladle Analysis)

Element	Composition Present
C	0.03 max.
Si	0.3 to 0.7
Mn	0.40 - 1.0
P	0.015 max.
S	0.015 max.
Co	0.015 max. (To be aimed 0.01)
Al	0.15 to 0.45
Ti	0.6 max.
N	0.03 max.
Cu	0.075 max.
Cr	20 - 23
Ni	32 - 35
Fe	Remainder

Stabilisation

$$\frac{Ti}{C} = 12 \text{ minimum}$$

$$\frac{Ti}{C + N} = 8 \text{ minimum}$$

$$(N + P) = 0.045 \text{ maximum}$$

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4.2 Process of Manufacture and Workmanship

The tubes shall be manufactured by cold working, heat treatment, final cold drawing to enhance yield strength, followed by straightening process. The tubes shall be supplied in U-bent form, in sizes and quantities indicated in the Purchaser's drawing. The tubes shall be cold bent with subsequent glass bead peening to introduce uniform controlled residual compressive stresses at the outside tube surface. The shot peening procedure and the equipment used shall be qualified by demonstrating its effectiveness in producing consistent quality of tubes having compressive stresses extending to a depth of about 0.15 mm. The procedure shall be submitted to the Purchaser for his approval.

Materials, process and workmanship shall be of high quality and in accordance with good practice pertinent to the manufacture of Nickel - Iron - Chromium alloy heat exchanger tubes. Each rolled bar which will be used for tube manufacture shall be ultrasonically checked for internal soundness. Sufficient discard shall be made from the bar corresponding to the top of the ingot to ensure freedom from cavities and slag inclusions. The bars shall be further examined by taking macro specimens from each end and also subjected to chemical analysis, which shall be within the specified limits stated under clause 4.1.

Material shall be manufactured from ingots melted in electric furnace.

4.3 Grain Size

The grain size shall be determined according to ASTM-E-112 and shall be ASTM micro-grain size number 8 or finer. Attempt shall be made to achieve a grain size of 10 or finer.

4.4 Halogen and Sulphur Content

Chemicals, oils, lubricants, paints etc. used during the manufacture, inspection/examination etc. of tubes shall not contain halogen and sulphur in excess of 25 ppm each. These shall also be free from lead. However, if for technical reasons the lubricants used for tube drawing contain halogens in excess of the above stipulated limit, these may be used provided the manufacturing procedure is such that excess of these element does not produce any harmful effect on quality of tubes on a long term trouble free service (40 years) basis. Subsequent cleaning shall, however, ensure cleanliness requirements stipulated in Section 12 of the specification.

4.5 Surface Condition

The tubes shall be in bright finish condition. The inside and outside surfaces of the tubes shall be very smooth and the finish after shot peening shall be better than 1.6 microns(CLA) on internal surfaces and 3.3 microns on external surface.

4.6 Heat Treatment

Tubes shall be supplied in cold worked condition, with glass bead, shot peening of the tube outer surface. The details of annealing temperature, soaking time etc. must be indicated in the test certificate. Detailed procedure of heat treatment shall be submitted for approval before start of manufacture. The details of heat treatment including furnace type, furnace atmosphere, rate of heating, soaking time, rate of cooling, thermocouple location etc. shall be submitted for approval before start of manufacture.

5.0 MECHANICAL TESTS

The following requirements shall be met with after final annealing and cold drawing. Unless otherwise stated testing shall be done in accordance with ASTM B 163.

5.1 Tensile Test

		At Room Temp.	At 350°C
Tensile strength	N/mm^2	569-697	495 min
	(Kp/mm^2)	(58 - 71)	(50.5 min.)
0.2% Yield strength	N/mm^2	334-471	295 min
	(Kp/mm^2)	(34 - 48)	(30.0 min.)
% Elongation on 5d Min.		30	To be reported

5.2 Hardness

The hardness shall be measured on sample tubes and shall be about 170 vickers. The maximum hardness however can be upto 270 Vickers in the cold worked part of the smallest bend. Hardness shall be checked on sample bent tubes before shot peening.

All measurements shall be done on the Vickers Scale.

5.3 Flare Test

Flare test shall be made on both ends of each tube with an expanding tool having an included angle of 60° until the specified outside diameter has been increased by 20%. The pieces cut from the tube ends for flare test shall be checked for freedom from temper discolouration on inside, before subjecting them to flare test.

5.4 Intergranular Corrosion resistance Test.

Intergranular corrosion resistance test shall be done in accordance with ASTM-G-28 on one sample from each melt and heat treatment batch. The specimen shall be sensitized by heating it up to 650°C, soaking for 15 minutes and then water quenching. The heating shall be rapid and shall not take more than 1.5 min. The corrosion rate as calculated per G-28 **shall not exceed 0.6 mm/year . The guaranteed** maximum value **of the corrosion rate shall be indicated in** the bid. 7

5.5 Stress Corrosion Cracking Test

Stress corrosion cracking test shall be done in accordance with ASTM-G-36 on samples from each melt and heat treatment batch. The tube specimens (with and without shot peening) shall be bent 180° to the shortest radius on order. The bends shall be immersed in boiling $MgCl_2$ solution for 100 hours. The effect of 100 hours boiling shall show no crack by examining at 400 magnification and also by liquid penetrant examination.

In addition to above SCC test, one sample per heat shall be boiled to determine the time required for initiation of crack or maximum of 500 hrs.

The residual stress developed on the tube shall be measured and reported.

5.6 Test Coupon Numbers and Location

A 'Lot' shall consist of 100 tubes max. from the same melt and heat treatment batch. Test coupons shall be taken from the finished tubes.

5.6.1 A ladle analysis for each heat shall be performed. One product analysis chemical shall be made on each 'lot of tubes'.

5.6.2 One tension test each at Room Temperature and at 350°C shall be made on each lot of tubes. The mechanical properties like Tensile Strength, Yield Strength and % Elongation etc. shall be recorded.

5.6.3 Hardness shall be measured on 3% of tubes in each lot.

5.6.4 One flare test shall be made on each end of every tube prior to cutting to length.

5.6.5 Intergranular corrosion test shall be done on one sample from each melt and heat treatment batch.

5.6.6 Microstructure and grain size shall be determined on one sample from each 'Lot'. Micrographs are to be attached to test reports.

5.6.7 One stress corrosion cracking test is to be done on one sample from each lot.

5.6.8 Surface roughness on OD and ID shall be measured on 1% tubes completed in each shift.

5.6.9 Compressive stress measurement on 3 sample tubes per heat treatment batch.

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6.0 NON DESTRUCTIVE EXAMINATION

6.1 Liquid Penetrant Examination (LPE)

The bent tubes, shall be subjected to Liquid Penetrant examination on the entire bent portion and on the legs for 150 mm length from each end, in accordance with ASTM-E-165 and SB-513 of ASME Code, Section II Part B. The extent of tubes subjected to Liquid Penetrant examination is set out in para 8.9. Penetrant examination shall be done prior to shot peening but after the hydraulic test. No indications are permitted.

6.2 Ultrasonic Examination

Each tube shall be ultrasonically examined after heat treatment. The procedure of ultrasonic examination shall be generally in accordance with articles of ASME Section V.

The standards for testing and acceptance criteria over and above ASME requirements shall be as follows:-

The reference specimen shall be of the nominal diameter, thickness, nominal composition and heat treated condition as the product being examined. The standard defect shall be internal and external notches both in transverse and longitudinal direction. The notches shall be saw tooth, wedge shaped groove having 60° angle opening, with sides at right angle and max. depth of 0.1 mm. The external notches shall be 1.5 mm long and internal notches 2.0 mm long.

The ultrasonic examination shall be done in two opposite circumferential and two opposite axial directions. Defect indications equal to or greater than those from the reference standard shall be unacceptable.

6.3 Eddy Current Examination

Each tube shall be subjected to eddy current examination as per SB 513 of ASME Section II part B except that in the reference standard a through wall hole not exceeding 0.8 mm in diameter shall be used in lieu of 1.6 mm diameter hole stated therein.

Defect indication equal to or greater than those from the reference standard shall be unacceptable.

In the event of an order bidder shall supply at least 10 straight tube pieces of at least 0.5 m length each containing various types of eddy current subsurface indications in mid half length, from the rejected (colour marked) tube stock during production job, eddy current examination. This would enable Purchaser to conduct any investigation using eddy current ID probes at a later date.

6.4 Non-destructive examination indications found to be within the acceptable standards shall be investigated to establish that they are harmless (eg. not cracks or pores) for the intended use of the tubes. Adequate number of such acceptable defects, catagorised into various types, shall be metallographically investigated. The results of investigation shall be documented to form a detailed illustrated catalogue of defects.

The categorised defect indications chosen for metallographic investigation shall be examined prior to sectioning by suitable eddy current ID probes to obtain eddy current signals of the individual defect location and recorded along with corresponding production UT/ET examination signal results to form part of defect catalogue. This is required in connection with signal interpretation during inservice inspection of tubes.

6.5 Thickness Measurement

Wall thickness over the entire length of each tube shall be measured ultrasonically and reported.

7.0 BENDING PROCEDURE QUALIFICATION

Before bending, the procedure of bending shall be qualified as under.

7.1 For each 100 number or less of tubes of smallest bend radius, 2 numbers (minimum) of bends of smallest radius shall be bent in each process of bending for qualification. These 2 sample bends shall be made in the presence of Purchaser or his Authorised Inspection Agency and subjected to following examinations:

7.1.1 Entire surface shall be visually examined for ripples, scratches and other surface defects. The cross sections at 2 positions minimum (to be agreed upon) for each bend shall be plotted by a suitable device to ascertain non-circularity and ovality.

7.1.2 Bending procedure qualification tubes shall be hydrostatic tested and after hydrostatic test entire bend surface shall be liquid penetrant tested. Radius of bend shall be checked by layout.

7.1.3 One of the two bends shall be cut transversely into eleven equally spaced sections starting at the start of the bend and finishing at the end of the bend (resulting in 10 rings) for further examination. The other bend is sectioned in longitudinal plane (Plane of flexure) into two halves for further examination.

7.1.4 Each of the above sections shall be examined for following:

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a) Visually examine internal surface for ripples, scratches and other surface defects.

b) Check the surface finish on internals as well as external surface on each bend sections.

c) Measure the wall thickness at internal and external apex as well as at neutral bending axis for each section and compare with the wall thickness before bending, at minimum of 3 places.

d) Measure the ovality and non-circularity at each section.

e) Measure hardness on each cut piece, at minimum of 3 places.

f) Optical illustration of the outline of the cross sections obtained by the two above said sectional planes (viz., Transverse and Longitudinal) for each of the test bends. Choice of the transverse sections for such illustrations shall be exercised by the Purchaser or his authorised inspection agency.

g) Non-circularity and ovality, thinning and other dimensions shall meet the requirements as specified in purchase drawing.

8.0 PRODUCTION CONTROL

8.1 The production of U bends shall be taken up after qualification of the bending procedure as stated above. Ovality and out of roundness shall be measured on each tube for the smallest bend radius. Beyond that, for each radius, the first two production bends shall be measured for ovality, non-circularity (outline of cross section), bend radius at 5 locations and surface defects and then every 10th bend shall be measured for these dimensions. Wall thickness at the bends shall be measured by UT on each tube in first and second row. For balance tubes, this shall be measured on first 2 tubes and then every 10th tube for each row. If wall thickness does not conform to the requirements for any bend, all the previous bends shall be checked.

8.2 The ovality in the U-bend portion as measured by micrometer screw gauge, shall not exceed 5%. Ovality for this purpose is defined as:

$$\text{Ovality} = \frac{\text{O.D. max.} - \text{O.D. min.}}{\text{O.D. nominal}}$$

where O.D = outside diameter.

8.3 Out of roundness of tube other than ovality shall be determined using the formula:

$$\frac{\text{maximum radius} - \text{minimum radius}}{\text{maximum radius}} \times 100\%$$

Where maxi radius = outside radius of smallest possible surrounding circle.

Minimum radius = smallest distance of contour from centre of smallest possible surrounding circle.

The out of roundness shall not exceed 6%.

8.4 Each bent tube shall be checked after shot peening by a ball go-through test with a specified ball diameter of 15.77 mm.

8.5 The internal and external surface finish shall be measured on 1% of the tubes completed in each shift. The tubes shall be very smooth and surface condition shall meet requirements stated in section 4.5.

8.6 The tubes shall be free from kinks/local distortions. The straight portion of bent tubes shall be straight within 0.5 mm in one meter. The tolerance on leg spacing shall be as per drg No. TAPP-3&4/33111/5001/DD Rev 0.

8.7 The tolerance on other parameters are as follows:-

Outside diameter	:	19.0 +0.12 -0.03 mm
Thickness	:	1.1 ±10%
Eccentricity $\left(\frac{t_{max} - t_{min}}{2 \times t_{avg}}\right)$	:	< 5%
Minimum wall thickness in the bend region	:	0.91 mm.
Leg length deviation	:	+3 -0.0 mm
Leg length difference	:	2 mm (maximum)
End squareness deviation	:	0.2 mm (maximum)
Bend radius < 300 mm tolerance > 300 mm	:	±0.75 mm ±1.50 mm

8.8 Each tube shall be hydrostatically tested as per requirements of para 9 of this specification. 12

Hydrostatic test shall be done after bending. For such tubes hydrostatic test on straight length tubes prior to bending is not required.

8.9 After hydrostatic test, U-Bends shall be examined by liquid penetrant method over complete U bend portion and also 150 mm from each end. The scope of LP shall be as follows.

8.9.1 All the tube bends of the smallest bend radius shall be L.P. checked. In case of any unacceptable indication found in this examination, all the bends in next higher radius shall also be subjected to LP check. This process will continue till all the bends in a particular radius are defect free. The charges for this examination are considered to be included in the cost of the product.

8.9.2 For remaining tube bends not covered under 8.9.1 shall be subjected to random LP examination upto a maximum of 2% of the remaining tube bends at purchaser's option. If any unacceptable defect is found in the examination all the tube bends in that radius and all the bends in lower radii shall be subjected to LP examination free of cost. The charges for this examination shall be on "unit rate" (LP charge/bend) indicated by the bidder for this random 2% LP check.

8.9.3 With above limited LP examination scope, the manufacturer shall be obliged to replace (free of cost) all the tubes having unacceptable defect revealed during LP examination conducted by the purchaser.

8.9.4 Alternatively, manufacturer may indicate LPE charges for all bent tubes on unit rate basis.

8.10 Glass bead peening procedure shall be qualified on sample tubes before taking up the production tubes. For sample tubes, 3 tubes must be taken out and kept for acceptance purposes with respect to uniformity and adequacy of peening operation as follows:

a) with maximum acceptance level

b) with normal acceptance level

c) with minimum acceptance level.

These samples shall be used as comparators for checking the peening operation. Separate sets of samples shall be made for comparison with straight and bent portion of U-tubes. The compressive stress values verses depth from the O.D. and I.D. tube surfaces shall be determined for the above three acceptance levels by an accurate method (such as x-ray diffraction). The procedure and stress values/profile shall be subjected to Purchaser's approval. **The bidder shall indicate the method and the guaranteed stress values/profile in his bid.** The compressive

stresses shall exist upto a minimum of 0.12 mm depth from the tube outside surface both in the straight and bent portions of the tube.

8.11 During production, internal and external surfaces of all tubes shall be visually inspected using optical aids such as boroscope for ascertaining freedom from surface defects and temper colours. If necessary, test pieces from tubes shall be taken and investigated. The complete external surface of the tubes shall be inspected for adequate and uniform peening effect and compared with reference standards for acceptance. U-tubes shall be in a free condition while their dimensions, straightness etc are being checked with respect to the specified values.

O.D. of each tube shall be checked either automatically by UT or manually by limit gauges at both ends and also over the entire length at random intervals. However, actual dimensions are to be recorded at those locations for a minimum of 1% of tubes, distributed over the whole production quantity.

8.12 REPAIRS

Repairs are generally not allowed. However, superficial external surface defects may be removed by mechanical means prior to the shot peening operation provided the minimum wall thickness requirement after repair are still complied with and the surface area is blended smoothly. The repaired area shall be re-examined by appropriate non-destructive examination to ascertain freedom from defects and subjected to wall thickness measurement. The repair procedure shall be prepared by the supplier and subject to purchaser's approval prior to its application on production tubes. Tubes repaired shall be clearly identified and reported to purchaser.

9.0 HYDROSTATIC TESTING

Each tube shall be hydrostatic tested at an internal pressure of 25 plus one minus zero MPa. The water used shall be demineralised water and shall have conductivity 10 μs/cm (max.) at inlet. An increase of 3 μs/cm (max.) at the outlet is permissible. The test pressure shall be maintained for a duration of 10 seconds minimum. The water used shall not have halogen and sulphur in excess of 25 ppm each.

10. DOCUMENTATION

10.1 Procedures And Plans

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The following procedures and plans shall be submitted to the Purchaser for review and approval in six copies each before start of manufacture. No manufacturing activity shall start unless written approval of related documents is obtained.

a) Manufacturing procedure giving sequence of operations right from melting, ingot pouring, tube manufacturing and testing.

b) Heat treatment plan.

c) Mechanical testing procedures.

d) Non-destructive Examination procedures.

e) Wall thickness measurement procedure.

f) Glass bead peening procedure.

g) Quality Assurance Manual/plan

h) Cleaning procedure adopted during various stages of manufacture.

i) Repair procedure.

j) Tube bending qualification and production bending/ control procedures (to include measurement/plotting of ovality, non-circularity/cross section).

k) Material samples and testing plan.

l) Metallurgical examination procedures (macro etch, microstructure and grainsize)

m) Dimensional control procedures (for ID, OD and bend radius etc.).

n) Surface finish measurement and inspection procedures.

o) Hydrotest procedure

p) Ball-pass through test procedure

q) Compressive stress measurement procedure.

r) Quantitative measurement of contaminants such as Chloride, SiO_2, halogens, sulphur and lead.

s) Corrosion resistance test procedure.

t) Any other procedure having bearing on tube quality.

10.2 Reports

The following reports shall be submitted to the Purchaser in Nine copies each. 15

a) Chemical analysis - laddle and product

b) **Mechanical test report**

c) Non-destructive examination report (along with properly identified recording strips for ultrasonic and Eddy current examinations showing defects accepted).

d) Heat treatment charts

e) Visual and dimensional inspection report

f) Hardness survey report

g) Metallurgical examination reports, with photographs (such as Macro-etch, Micro-structure/grain size).

h) Illustrated catalogue of defects

i) Corrosion resistance test reports, with photographs.

j) Compressive stress measurement report

k) Tube bending qualification and production bend reports.

l) Surface finish reports

m) Hydrotest reports

n) Liquid penetrant examination reports

o) Ball-pass through test reports

p) Cleanliness/quantitative measurement of contaminants reports

q) Material mix up test reports

r) Any other reports on examinations/inspections/tests conducted on tubes for ensuring tube quality.

One set of test reports/certificates including packing list shall be sent along with the material in a suitable fashion to facilitate inventory control identification, and release of material to fabricators of heat exchangers from Purchaser's stores.

11.0 QUALITY SURVEILLANCE

The material covered in this specification shall be subjected to quality surveillance by the Purchaser or his Authorised inspection agency. The Purchaser and/or his Authorised Inspection Agency shall have access to the suppliers works at all reasonable times to carry out quality surveillance on the item ordered. The Supplier shall render all necessary help and extend inspection and testing facilities to the Purchaser/Authorised Inspection Agency to satisfy him that the material is being furnished in accordance with this specification. 16

The Purchaser or his 'Authorised Inspection Agency' will witness the tests at various stages as indicated below. The stages shall be clearly identified in the manufacturing plan to be submitted by the supplier in the required format. The supplier shall notify the inspection agency and the Purchaser atleast a fortnight before the commencement of each stage of testing.

a) Heat Treatment

b) Ultrasonic Tests

c) Eddy Current Tests

d) Mechanical Tests

e) Corrosion Resistance Test

f) Bending Procedure Qualification

g) Hydrostatic Test

h) Liquid Penetrant Examination

i) Preparation of reference samples for tube bends and for glass bead peering

j) Glass bead peering qualification

k) Ball-test on first three small radii U-bends

l) Final Visual Examination & Marketing

m) Cleanliness before packing

n) Packaging for shipment

12.0 CLEANING, IDENTIFICATION MATERIAL MIX-UP TEST, PACKING & SHIPMENT

12.1 Cleaning

Each tube shall be thoroughly cleaned inside and outside prior to packing. Outside may be cleaned by wiping with cloth soaked in acetone. Inside cleaning shall be done by passing a clean felt sponge ball with the help of oil free dry air or Nitrogen until the ball at exist shows no discolouration during its passage through the tube. The cleanliness shall be checked by wiping test as follows:

a) Qualitative evaluation of unacceptable dust, oil etc.

b) Quantitative evaluation of chlorides, silica, lead, halogens and sulphur. These contaminants shall be as low as possible. The bidder shall give in their bid the guaranteed maximum values which shall be less than the following:

17

Chlorides	20	μg/dm^2
Silica	30	μg/dm^2
Halogens & Sulphur (total)	25	p.p.m.
Lead, Flourides and sulphate	to be indicated	

Cleanliness check shall be carried out on one tube per 500 tubes.

c) Chemicals, lubricants, cleaning agents and any other materials used in the manufacture, inspection testing & packaging shall be free from contaminants such as halogens and sulphur. In any case sulphur & halogens shall not exceed 25 ppm each.

12.2 Identification

The tube number shall be marked on each tube by electro etching or by any other suitable permanent marking method, at approximately 200 mm from each end. Complete history of each tube shall be available in Check List/Test Certificates which shall be placed in box containing the tube. As a minimum, following information shall be provided in the Check List: Material Specification, Melt Heat No. & Lot No., Supply Condition, Tube Identification number and Radius of Bend.

In addition each box containing tubes shall bear the Purchase Order number, destination, size and number of tubes, manufacturer's symbol and authorised inspection agency's seal.

12.3 Testing For Material Mix-up

Spectroscopic, semiqualitative, non-destructive (sigma test) check shall be carried out to ascertain the tube of the same type of alloy from different quality manufacture are not mixed up during production and testing.

12.4 Packing And Shipment

After cleaning, both ends of each tube shall be plugged with special plug. At each end two plugs and one plastic cap (halogen free) shall be put.

Each tube shall be packed in halogen free polythene sleeve and heat sealed on both ends. The polythene sleeve shall be of soft grade (transparent) and at least 0.1 mm thick. The U bends shall be packed in a proper sequence and other packing requirements as per BHEL drawing for packing details-U-tubes indicated in the tender document.

The tubes shall be packed full length in suitable padded water proof containers suitable not only for transpor-

tation but also for long storage in tropical conditions. Special precautions shall be taken to ensure that no hard or sharp object such as nails etc. project into the container to possibly damage the tubing. Each package shall also contain corresponding packing list. The container is likely to be subjected to multiple handling at docks in an event of trans-shipment. The containers should be designed sturdily to withstand such multiple handling and would require the approval of Purchaser. The packing boxes shall be reinforced by welded cross steel beams. The packing cases may be inspected on arrival as a precautionary measure by the Purchaser.

12.5 The supplier shall be responsible for the shipment and safe delivery of tubes to the destination, specified in the pertinent tender document or purchase order. The tubes shall be shipped 'UNDER DECK' only in the ship to avoid sea water entry into the boxes during the shipment. The tubes shall be protected and covered to prevent damages, corrosion and ingress of foreign material.

12.6 <u>Identification During Shipment</u>

Each package shall be clearly and legibly marked in suitable permanent manner with following information:

a) Purchase Order Number

b) Destination

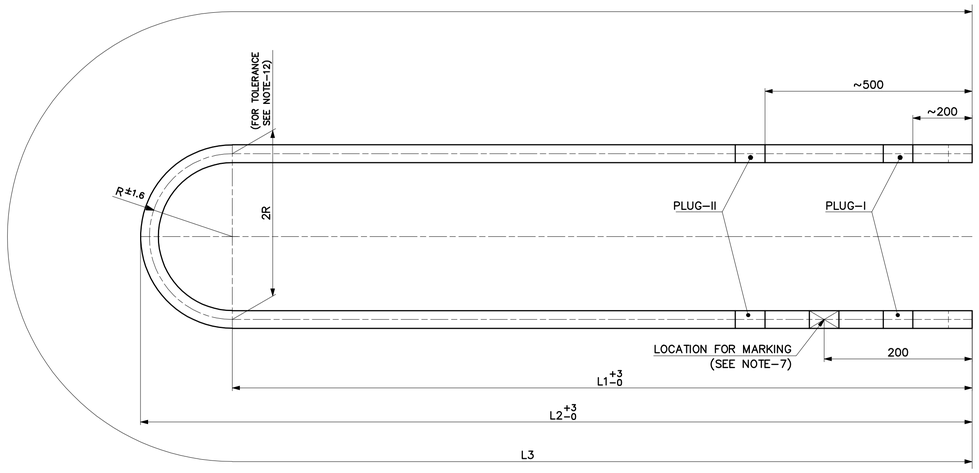
c) Size and Number of Tubes

d) Manufacturer's Emblem

e) Seal of the Authorised Inspection Agency

DRAWING NO: 1-93-170-05127

ALL DIMENSIONS ARE IN MILLIMETERS



NOTES: –

1. APPLICABLE SPECIFICATIONS : PB–M–131
2. MATERIAL SPECIFICATION : INCOLOY–800.
3. SIZE
   OUTSIDE DIAMETER : $19.0^{+0.12}_{-0.03}$
   THICKNESS : $1.1^{\pm 10\%}$
4. FOR DETAILS OF TOLERANCE ON BENDING RADIUS, PERMISSIBLE THINNING, MIN. THICKNESS, OVALITY ON BEND REGION, ETC., AND SUPPLY CONDITIONS, REFER THE APPLICABLE SPECIFICATION, PB–M–131.
5. HYDROSTATIC TEST PRESSURE : 25^{+1}_{-0} MPa.
6. TWO FELT PLUGS ON EITHER END OF THE TUBE SHALL BE PROVIDED AT LOCATIONS AS SHOWN IN THE DRAWING.
7. MARKING ON THE TUBE SHALL BE DONE AT LOCATION SHOWN ; ELECTRICAL ETCHING METHOD SHALL BE ADOPTED FOR THE ABOVE.
8. QUANTITIES INDICATED IN THE DRAWING ARE FOR ONE HEAT EXCHANGER ONLY.
9. ALL QUANTITIES SHALL BE COVRED IN AS FEW NUMBER OF MELTS AS PRACTICABLE.
10. REFER DRAWING NO. 0–93–170–05096, FOR PACKING DETAILS.
11. IN ADDITION , 500 METRES OF STRAIGHT TUBES IN LENGTHS OF 5 TO 10 METRES SHALL BE SUPPLIED ENSURING THAT
    a) ALL MELTS ARE COVERED.
    b) MINIMUM OF 30 m/MELT IS PROVIDED.
12. TOLERANCE ON LEG SPACING SHALL BE AS GIVEN BELOW:

SL.NO.	BEND RADIUS, R (mm)	TOLERANCE ON DIMN 2R (mm)
1	LESS THAN 220	±1.0
2	220 < R < 450	±1.6
3	450 < R < 760	±2.0
4	MORE THAN 760	±2.5

01

VAR NO	R (mm)	L1 (mm)	L2 (mm)	L3 (DEVELOPED LENGTH mm)	NO.OFF/ HEX.	Wt/UNIT (kg)
1	91.0	10820.5	10921.0	21926.9	42	10.85
2	104.0	10827.0	10940.5	21980.7	45	10.88
3	117.0	10833.5	10960.0	22034.6	44	10.90
4	130.0	10840.0	10979.5	22088.4	45	10.93
5	143.0	10846.5	10999.0	22142.2	44	10.96
6	156.0	10853.0	11018.5	22196.1	45	10.98
7	169.0	10859.5	11038.0	22249.9	44	11.01
8	182.0	10866.0	11057.5	22303.8	45	11.04
9	195.0	10872.5	11077.0	22357.6	44	11.06
10	208.0	10879.0	11096.5	22411.5	45	11.09
11	221.0	10885.5	11116.0	22465.3	44	11.12
12	234.0	10892.0	11135.5	22519.1	44	11.14
13	247.0	10898.5	11155.0	22573.0	44	11.17
14	260.0	10905.0	11174.5	22626.8	43	11.19
15	273.0	10911.5	11194.0	22680.7	44	11.22
16	286.0	10918.0	11213.5	22734.5	43	11.25
17	299.0	10924.5	11233.0	22788.3	42	11.28
18	312.0	10931.0	11252.5	22842.2	43	11.30
19	325.0	10937.5	11272.0	22896.0	42	11.33
20	338.0	10944.0	11291.5	22949.9	43	11.36
21	351.0	10950.5	11311.0	23003.7	42	11.38
22	364.0	10957.0	11330.5	23057.5	43	11.41
23	377.0	10963.5	11350.0	23111.4	42	11.44
24	390.0	10970.0	11369.5	23165.2	41	11.46
25	403.0	10976.5	11389.0	23219.1	42	11.49
26	416.0	10983.0	11408.5	23272.9	41	11.52
27	429.0	10989.5	11428.0	23326.7	42	11.54
28	442.0	10996.0	11447.5	23380.6	41	11.57
29	455.0	11002.5	11467.0	23434.4	40	11.59
30	468.0	11009.0	11486.5	23488.3	41	11.62

VAR NO	R (mm)	L1 (mm)	L2 (mm)	L3 (DEVELOPED LENGTH mm)	NO.OFF/ HEX.	Wt/UNIT (kg)
31	481.0	11015.5	11506.0	23542.1	40	11.65
32	494.00	11022.0	11525.5	23595.9	39	11.68
33	507.00	11028.5	11545.0	23649.8	40	11.70
34	520.00	11035.0	11564.5	23703.6	39	11.73
35	533.00	11041.5	11584.0	23757.5	38	11.76
36	546.00	11048.0	11603.5	23811.3	**39**	11.78
37	559.00	11054.5	11623.0	23865.2	38	11.81
38	572.00	11061.0	11642.5	23919.0	**35**	11.84
39	585.00	11067.5	11662.0	23972.8	38	11.86
40	598.00	11074.0	11681.5	24026.7	37	11.89
41	611.00	11080.5	11701.0	24080.5	36	11.92
42	624.00	11087.0	11720.5	24134.4	35	11.94
43	637.00	11093.5	11740.0	24188.2	36	11.97
44	650.00	11100.0	11759.5	24242.0	35	11.99
45	663.00	11106.5	11779.0	24295.9	34	12.02
46	676.00	11113.0	11798.5	24349.7	33	12.05
47	689.00	11119.5	11818.0	24403.6	34	12.08
48	702.00	11126.0	11837.5	24457.4	33	12.10
49	715.00	11132.5	11857.0	24511.2	32	12.13
50	728.00	11139.0	11876.5	24565.1	31	12.16
51	741.00	11145.5	11896.0	24618.9	32	12.18
52	754.00	11152.0	11915.5	24672.8	31	12.20
53	767.00	11158.5	11935.0	24726.6	30	12.24
54	780.00	11165.0	11954.5	24780.4	29	12.26
55	793.00	11171.5	11974.0	24834.3	28	12.29
56	806.00	11178.0	11993.5	24888.1	27	12.32
57	819.00	11184.5	12013.0	24942.0	26	12.34
58	832.00	11191.0	12032.5	24995.8	27	12.37
59	845.00	11197.5	12052.0	25049.6	26	12.39
60	858.00	11204.0	12071.5	25103.5	25	12.42

VAR NO	R (mm)	L1 (mm)	L2 (mm)	L3 (DEVELOPED LENGTH mm)	NO.OFF/ HEX.	Wt/UNIT (kg)
61	871.0	11210.50	12091.0	25157.3	24	12.45
62	884.0	11217.00	12110.5	25211.2	23	12.48
63	897.0	11223.50	12130.0	25265.0	22	12.50
64	910.0	11230.00	12149.5	25318.8	21	12.53
65	923.0	11236.50	12169.0	25372.7	20	12.56
66	936.0	11243.00	12188.5	25426.5	17	12.58
67	949.0	11249.50	12208.0	25480.4	16	12.61
68	962.0	11256.00	12227.5	25534.2	15	12.64
69	975.0	11262.50	12247.0	25588.1	14	12.66
70	988.0	11269.00	12266.5	25641.9	11	12.69
71	1001.0	11275.50	12286.0	25695.7	8	12.72
72	1014.0	11282.00	12305.5	25749.6	5	12.74

TOLERANCE IF NOT SPECIFIED SHALL BE AS BELOW (REFER IS 2102-1)

LINEAR				ANGULAR	
0.5 TO 3	±0.1	400 TO 1000	±0.8	0 TO 10	± 1°
3 TO 6	±0.1	1000 TO 2000	±1.2	10 TO 50	± 30'
6 TO 30	±0.2	2000 TO 4000	±2.0	50 TO 120	± 20'
30 TO 120	±0.3	–	–	120 TO 400	± 10'
120 TO 400	±0.5	–	–	OVER 400	± 5'

REV	DATE	ALTERED :	REV	DATE	ALTERED :
02	171209	CHD&APPD :	01	150409	CHD&APPD :
PROJECT NAME ADDED IN TITLE BLOCK			'KAPP–3' ADDED IN TITLE BLOCK. NOTE–13 REMOVED.		

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 700MWe/KAPP-3/RAPP-7

Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014
05-227/D

	NAME	SIGNATURE	DATE	NO. OF VAR
DRN	N.K.		180706	
CHD	SOUGAT		120608	
APPD	V.R		140608	

DEPT	GRADE OF UNTOL. DIM		SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	NO OF ITEMS
NC	C/M/F		NTS	28990	KAPP-3&4/33111/4019/DD		
CODE 150							

TITLE: U–TUBES (SA–20)

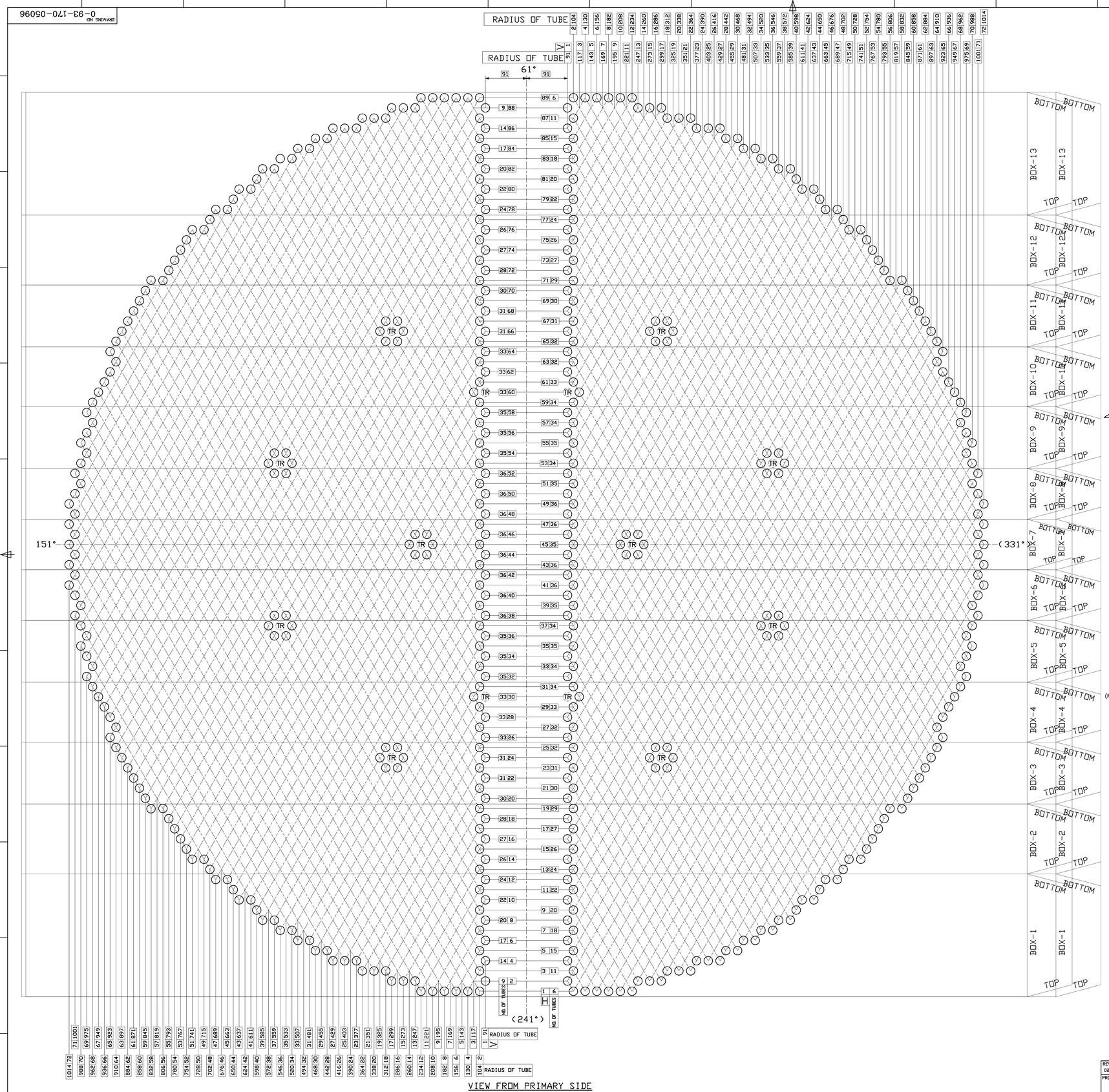
CARD CODE: U 01

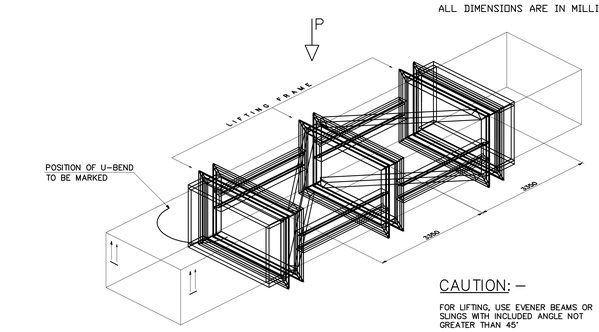
DRAWING NO : 1–93–170–05127 REV 02

Size A1

DRAWING NO. 0-93-170-06096

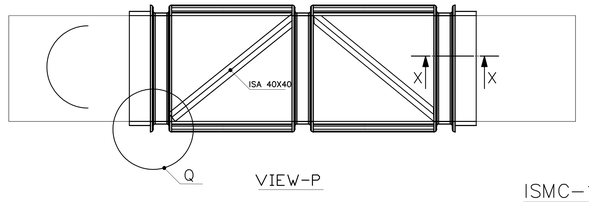
ALL DIMENSIONS ARE IN MILLIMETERS



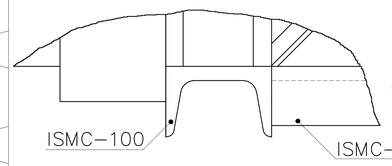


CAUTION: –

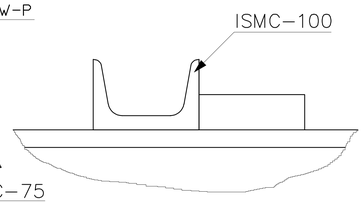
FOR LIFTING, USE EVENER BEAMS OR SLINGS WITH INCLUDED ANGLE NOT GREATER THAN 45°



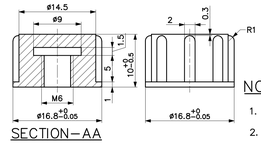
VIEW-P



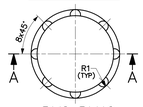
DETAIL-Q



DETAIL-XX



SECTION-AA



PVC PLUG

(REFER NOTE-6 OF DRG. 1-93-170-05127)

NOTES: –

1. REFER DRG. NO 1-93-170-05127 FOR U-TUBES.
2. THE VIEW SHOWN IS FROM THE PRIMARY SIDE OF TUBE SHEET.
3. THE TOTAL WEIGHT OF EACH BOX SHALL BE APPROXIMATELY 3000-4000KG.
4. MATERIAL MELT NO. AND TUBE POSITION NO. SHALL BE INDICATED ON A TAG TIED TO EACH TUBE.
5. 'TR' INDICATES THE TIEROD POSITIONS AND THERE ARE NO TUBES AT THESE POSITIONS.
6. TUBING THE HEX. WILL START FROM LOWER SIDE WITH H=1. HENCE THE PACKING OF THE TUBES SHALL BE CARRIED OUT VICE VERSA ie., STARTING WITH H=89
7. THE WELDS BETWEEN THE CHANNELS AT THE TOP OF THE LIFTING FRAME SHALL BE SUCH THAT THEY ARE EASILY REMOVABLE.
8. THE BOX NUMBER AND POSITION OF 'U' BEND REGION SHALL BE CLEARLY MARKED ON EACH BOX USING PERMANENT PAINT.
9. FOR LIFTING, USE EVENER BEAM OR SLINGS WITH INCLUDED ANGLE NOT GREATER THAN 45°. THE SUPPLIER SHALL ALSO PAINT THE ABOVE CLEARLY ON THE BOX WITH CAUTION MARK AS A GUIDE LINE AS INDICATED IN THE DRG., FOR HANDLING OUT SIDE HIS WORKS.
10. EACH TUBE SHALL BE PACKED IN A WATER PROOF HALOGEN FREE POLYTHENE COVER.
11. THE CIRCUMFERENCE OF THE POLYTHENE COVER SHALL BE APPROXIMATELY 150 mm TO ENSURE SUFFICIENT FREE SPACE AROUND THE TUBE.
12. THE THICKNESS OF THE POLYTHENE COVER USED FOR INDIVIDUAL TUBE PACKING SHALL BE MINIMUM 120 MICRONS.
13. THE POLYTHENE QUALITY SHALL BE SUCH THAT, THE COVER DOES NOT UNDERGO DISINTEGRATION.
14. EACH INDIVIDUAL WOODEN BOX SHALL BE WATER PROOF IN ORDER NOT TO ALLOW EVEN TRACES OF WATER INTO THE BOX DURING TRANSPORTATION AND STORAGE.
15. THE WOOD QUALITY SHALL BE SUCH THAT, THE WOOD DOES NOT UNDERGO DISINTEGRATION.
16. PACKING SHALL BE VERIFIED AND CHECKED BY THE THIRD PARTY INSPECTOR BEFORE CLOSING THE BOX.

REV	DATE	ALTERED :	CHD&APPD :
02	171209	PROJECT NAME ADDED IN TITLE BLOCK	
01	150409	'KAPP-3' ADDED IN TITLE BLOCK	

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 700MWe/KAPP-3/RAPP-7

Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI - 620014

	NAME	SIGNATURE	DATE	NO. OF TAB
DSN	K.R.		060208	
CHD	MANDAL		170608	
APPD	V.R.		180608	

DEPT: NC | CODE: 150 | GRADE OF CNTRL DIM: C/M/F | SCALE: | WEIGHT (Kg): - - - | REF TO ASSY / OLD DWG: KAPP-3&4/33111/4020/DD | ITEM NO | NO. OF ITEMS

TITLE: PACKING DETAILS U-TUBES(SA-20)

CARD CODE: U 01

DRAWING NO: 0-93-170-05096 | REV: 02

Size A0

IMPORT ENQ

TERMS AND CONDITIONS

1. OFFER:

Offer in ENGLISH LANGUAGE AND IN TRIPLICATE in a SEALED COVER SUPERSCRIBING the enquiry number ad the due date shall be submitted addressed to:

THE MANAGER / PURCHASE / FB
BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT
THIRUCHIRAPPALLI – 620 014
TAMIL NADU
INDIA

offers should be firm for net FOB Nearest Sea Port price and C&F chennai port, indicating the shipping specifications and the earliest delivery inrespectof offers from overseas suppliers. Offers from indigenous sources shall be firm for FOR TIRUCHIRAPPALLI

2. DOCUMENTS:

(1) offers should be accompanied by detailed technical literature, catalogue and detailed dimensional drawings in ENGLISH and in TRIPLICATE, or otherwise, the offers will not be considered.

(2) incase overseas suppliers route their offer through their accredited selling agents, a letter of authority should be furnished mentioning the name and address of their selling agents, who are authorized to bid, negotiate and conclude a contract on their behalf.

3.AGENCY COMMISSION:

(1) inrespectof offers from overseas suppliers, agency commission, if any, payable to their agents in India, shall invariable be shown separately in the Performa invoice and this will be paid by us in India, in Indian rupees, on satisfactory completion of the contract.

(2) it overseas principal has any til- up with any third party in respect of agency commission it should be declared while submitting offers.

(3) copies of current agency agreement / authorization letter in respect of agency commission shall be furnished along with offer, if not made available earlier.

(4) for calculation of rupee equivalent of agency commission, exchange rate as prevailing on the date of order will be taken.

4. SPARES:

The tenderer should quote separately for spares that are required for two years trouble free operation. The spares offer should accompany the offer of main equipment, Otherwise the quotations will be overlooked.

5. VALIDITY:

The offers for main equipment and spares shall be kept open for acceptance for 120 days (one hundred and twenty days) from the date of opening of the tender.

6. TEST CERTIFICATES, OPERATING AND MAINTENANCE MANUALS:

The tenderer shall clearly mention in their offer, that test certificates and operation and maintenance manuals, etc., as called for in the technical specification, in the required number of copies will be provided at no extra cost. If any amount is payable as extra, the same shall be indicated separately in the offer.

7. TERMS OF PAYMENT:

In the event of and order the purchaser will arrange for and irrevocable letter of credit against presentation of documents. Under no circumstances confirmed and irrevocable latter of credit will be established by the purchaser.

8. GENERAL:

(1) preference will be given to suitable indigenous or ex-stock in ported offers, failing which imported offers from incoming consignment against the indigenous supplies "stock and license" will be accepted, if "stock and sale license" is not available with the indigenous suppliers, the same shall be indicated in their offer.

(2) bank guarantee: the supplier in the event of an order, should furnish a bank guarantee from an approved bank at no extra cost in a Performa which will be supplied to the supplier, along with the order, for an amount equivalent to 10% of the value of the contract. The bank guarantee should remain in full force and effect during the period that would be taken for successful completion of the contract and shall continue to be enforceable till 12 months from the date of receipt of consignment at purchaser's site or 18 months from the date of last shipment at the port of delivery whichever is earlier.

9. LD/ PENALTY AND INTEREST ON ADVANCES FOR DELAY IN DELIVERY:

" if the supplier fails to delivery the raw materials / equipment / components within the period specified in the contract the purchaser shall deduct liquidated damages a sum equivalent to 0.5% of the price for each week of delay upto a maximum of 15% of the price of the delayed / undelivered goods, in addition to the recovery of interest at normal cash credit rate plus 2% for the unadjusted portion of the advances. If the delay in delivery of a part contributes to delay in execution of total system, LD and interest on advances will be recovered on the total contract price / total advance paid"

INDIGENOUS ENG

TERMS AND CONDITIONS

1.A) QUOTATIONS: Each tender should be sent in double cover, inner cover should be sealed with tenderer's distinctive seal and super scribed with correct tender no. Item of supply and due date of opening the outer cover should only bear the address of this office and should not have any indication that a tender is within. Tow or more quotation should not be sent in one cover but the quotation against each tender should be sent separately to avoid confusion. Tender should not be addressed to any individual's name but only by designation.

b) Tenders should be free from CORRECTION AND ERASURES. Corrections if any must be attested; all amounts shall be indicated both in words as well as in figures. Where there is difference between amount quoted in words and figures, amount quoted in words shall prevail.

c) Price should be nett F.O.R. dispatching station inclusive of risk in transit and remain valid for 60 days from the due date.

d) If any sales tax is payable as extra to the quoted price is should be specifically stated in quotations along with CST &TNGST no falling which the purchaser will not be liable for payment of sales tax. Our T.N.G.S.T no 3560005 dt. 01.04.1995 CST no 239383 dt, 11.06.1991

e) No revision of prices will be entertained after tenders are opened.

f) Manufacturer's name trademark or patent no if any should be specified. Illustrative leaflets giving technical particulars are required along with quotation wherever necessary.

g) Products with I.S.I certification marks will be preferred.

h) The purchaser shall be under no obligation to accept the lowest or any other tender and shall be entitled to accept or full without assigning any reason whatsoever.

2. SAMPLES: Wherever possible sample should be submitted separately whether specifically requested or not so as to reach the purchaser on or before the due date of the enquiry. They should be clearly marked with the enquiry no and the date on the outside cover to facilitate identification.

3. PACKING AND MARKING: The supplier shall arrange for securely protecting and packing the stores to avoid loss or damages during transit.

4. TERMS OF PAYMENT: Payment will be made within 30 days of satisfactory receipt of materials at site. Wherever required by the purchaser, the successful tenderer must send the Operation and Maintenance manuals, Test Certificates, drawings, etc., for the materials ordered. These should be sent immediately after dispatch of the materials and a statement to that effect should be made in the invoice. Failure to comply with this provision will result in delay in payment of the bills. Goods dispatched either by V.P.P or by the document presented through bank will not be accepted unless agreed to by the purchaser.

The duplicate copy of the invoice meant for the transporters should accompany the material as stipulated under C.E. rules 52a and 173 c (or) 57gg. A Photostat copy of the above invoice for each Delivery Chelan should be submitted along with the original bills routed through bank or submitted directly to BHEL finance department.

5. SECURITY DEPOSIT: For purchases over Rs. 5000/- the successful tenderers may be requested to furnish a Bank Guarantee, Security deposit for an appropriate value as may be determined by BHEL

6. LIQUIDATED DAMAGES PENALTY AND INTEREST ON ADVANCES FOR DELAY IN DELIVERY:

If the supplier fails to deliver the raw material equipment components within the period specified in the contract the purchaser shall deduct liquidated damages a sum equivalent to 0.5% of the price for each week of delay up to maximum of 15% of the price of the delayed undelivered goods. In addition to the recovery of interest at normal cash credit rate plus 2% for the unadjusted portion of the advances. If the delay in delivery of a part contributes to delay in execution of total system, LD and interest on advances will be recovered on the total contract price total advance paid.

7. RISK PURCHASE: Alternatively the purchaser at his option will be entitled to terminate the contract and to purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or dispatch within the time stipulated as aforesaid or if the same were not available, the best and the nearest available substitutes therefore. The supplier shall be liable for any loss, which the purchaser may sustain by reason of such risk purchases in addition to penalty at the rate mentioned in clause 6 above.

8. PREFERENTIAL DELIVERY: It should be noted if a contract is placed on a higher tenderer as a result of this invitation to tender in preference to the lowest acceptable offer in consideration of the earlier delivery, the seller will be liable to pay to the purchaser the difference between the contract rate and that of the lowest acceptable tender on the basis of final price F.O.R destination, including all eliminates of freights. Sales tax, duties and other incidents, incidental in case of failure to complete suppliers in terms of such contract within the date of delivery specified in the tender and incorporated in the contract.

9. MODVAT CREDIT: If any Excise Duty is payable, the chapter head / Sub –head reference and the rate of the duty should be quoted. If the tender is availing MODVAT credit for this input material, the effect of Proforma credit should be passed on to the purchaser. Tenderer under "MODVAT" shall be preferred.

10. PURCHASE: Preference will be given to CPSUS as per. Government guidelines.

11. GENERAL: The purchaser reserves the right to split up the tender and place order for individual terms with different tenderers and also increase or decrease the quantity.

Any other conditions which might have been quoted by the seller and are in contravention to the terms prescribed in the order and which have not been specifically accepted in by purchaser will not be applicable to the contract.