

**BHARAT HEAVY ELECTRICALS LIMITED**  
**HEEP: HARDWAR-249 403 (UA)**  
**Fax: 01334-226462/223948, Phone: 281282**  
**E-mail: [ajayk@bhelhwr.co.in](mailto:ajayk@bhelhwr.co.in)**

**No. F/T237/6/1541/K**

**Date: 20<sup>th</sup> June'06**

**Subject: Open tender as detailed below:**

**OPEN TENDER**

1. Sealed tenders with the Tender No. and opening date clearly super scribed on the cover are invited from the manufacturers/their authorized agents for the supply of the following items:-
2. Last date for taking tender documents and opening of tenders is indicated against each tender. Tenders will be received up to 1.45 P.M. on opening date and opened on the same day at 2.00 P.M. in the Tender Room.
3. Intending vendors must remit the tender fee of Rs. 2,000.00 for indigenous supplies (equivalent foreign currency \$ 50.00 / € 40.00) from foreign vendors against each tender along with the requisite EMD in the form of bank draft while submitting the tender documents as detailed in "Instruction to Bidders", after down loading from this web site.
4. BHEL will not be responsible for any type of postal delay / incomplete information from vendor.
5. Other terms and conditions will be as per tender documents.

| Sl. No. | Tender No.     | Description of Item  | Qty. (Nos.) | Last date to get from BHEL | Opening date |
|---------|----------------|--|-------------|----------------------------|--------------|
| 1.      | F/T237/6/1541K | S.S.Welded U tubes<br>(as per enclosed specification & Drg.) | 1478        | 03.08.06                   | 04.08.06     |

**(A. K.Gupta)**  
**Manager (Purchase-F&HE)**



**BHARAT HEAVY ELECTRICALS LIMITED  
HEEP HARIDWAR INDIA-PIN 249403  
FAX NO: 0091 1334 226462/223948  
PHONE NO: 0091 1334 281282**

**Enq. No.: F/T237/6/1541/K**

**Date of issue: 20<sup>th</sup> June'06**

**Due Date: 4<sup>th</sup> Aug'06**

**M/S.....**

**Sub: Tender Enquiry No. F/T237/6/1541K.**

Dear Sir,

We are pleased to invite your offer in TWO PARTS.

Strictly as per enclosed terms and conditions and instruction to bidders, in sealed covers for the under mentioned equipment/systems.

| S.N. | Description  | Qty.      | Delivery Required | EMD (Earnest Money Deposit)   |
|------|--|-----------|-------------------|---|
| 1.   | S.S.Welded U Tubes<br>as per enclosed Specification & Drg. | 1478 nos. | 30.11.2006        | Rs. 50,000.00/-<br>(Fifty thousand or<br>equivalent Foreign currency) |

Please submit your lowest quotation / offer for the above requirement subject to our terms and conditions. Your offer should reach us on or before the due date by 1.45 PM.

**NOTE: The vendor should submit their best price at this stage it self and they will not be allowed to revise the price. Any revision / discount given by vendor subsequently will be ignored & the bid is likely to be rejected.**

Part-1 bids shall be opened of those vendors **ONLY AFTER ENSURING PROOF OF EMD AND TENDER FEE (PLEASE SUBMIT SEPARATE DRAFTS FOR EMD AND TENDER FEE {drawn in favour of BHEL Hardwar} IN ANOTHER ENVELOPE SUPERSCRIBED WITH BOLD LETTERS "EMD & TENDER FEE")** at 2 PM on the due date in the presence of authorized representatives of the bidders who may like to be present. The authorized representative should bring authority letter from their principals (if any) for attending the bid opening. All Govt. of India / PSU / State Govt. entities are exempted from submission of EMD. Purchase preference will be given to CPSE s as per GOI notification no. DPE/13(12) 2003-Fin. Dated 26th Oct'04.

KINDLY READ "INSTRUCTIONS TO BIDDERS", QUOTATION NOT IN ACCORDANCE WITH THE ABOVE INSTRUCTIONS ARE LIABLE TO BE DISQUALIFIED AND IGNORED.

Thanking You,  
Yours Faithfully,  
For & ON BEHALF OF BHEL, HARDWAR

**(A. K.Gupta)**  
**Mgr. (PPX-F&HE)**

## **INSTRUCTIONS TO BIDDERS FOR OPEN TENDER**

Only those bids will be opened which has been submitted with requisite EMD & tender fee.

Vendors who are not registered with BHEL Haridwar for S.S.Welded U tubes have to submit the filled-in Supplier registration form with the offer .Supplier Registration form can also be downloaded from site [www.bhel.com](http://www.bhel.com) .The qualifying requirements shall be as follows which are to be confirmed by the vendors and documents/credentials to be attached:-

1. Vendor should have manufactured the S.S.Welded U tubes of the following sizes & material grade :-
  - OD 16 mm to 25 mm
  - Thickness 0.90 mm or less
  - Bend radius 2D or less
  - Material Grade ASME SA688 Gr. 304/316Test Certificates alongwith unpriced copy of Purchase Order in English language should be submitted .
2. Vendor should confirm for Residual Stress limited to 4 kg/mm<sup>2</sup> & test results should be submitted .
3. Vendor should have two years performance Experience ( preferably in supply to the Power Plants ) in supply of the tubes meeting criteria mentioned at point no. 1 above . Experience details giving Size/Grade/Quantity/Customer/Date of supply/Date of commissioning to be submitted .
4. Vendor should have ISO9001 certificate . Copy of the same to be submitted .
5. Total manufacturing should be inhouse . Vendor should submit their manufacturing & testing facilities details .

**Offers of only those vendors will be processed who meet the qualifying requirements.**

- 1.0 The tenders shall be submitted in three parts (part I Techno -Commercial Bid & part II price Bid & part III Supplier Registration form ) as described below on or before the due date.
  - The Quotation should be from the Principal / Original Supplier , failing which the quotation is likely to be ignored.
  - Any corrections / amendments shall be properly & fully authenticated with signature.
- 1.1 **PART-I (TECHNO-COMMERCIAL BID)** shall comprise of following documents:
  - a) Complete Technical offer in TWO sets (one original + one copy).
  - b) Complete reference of the past supply of S.S.Welded U tubes ( as per point no. 3 of the Qualifying Requirements )
  - c) Acceptance of commercial terms by vendor as per Annexure 1.
  - d) Deviation with reference to specification to be laid down on separate sheet.
  - e) Copy of price Bid (without prices).
  - f) Validity of offer should be at least 120 days from tender opening.

- g) Quality plan to be submitted in the enclosed BHEL Q.P. format for approval . Quality plan should enclose vendor's own standard, test procedures, cross-referred, if any.
- h) Any additional documents (please specify).

## **1.2 PART-II (PRICE BID)**

The price Bid (with price) which has been submitted with part I for the complete scope as specified in the price Format attached as Annexure-2.

### **1.2.1 Price should be quoted as under.**

**For Indigenous Suppliers** – Indigenous vendors should quote on FOR Stores HEEP BHEL Haridwar basis . However , the insurance will be arranged by BHEL . Vendors can dispatch the material through any Indian Bank Association approved transporters having their branch at Haridwar . For the convenience of the vendors the names and addresses of transporters approved by IBA & BHEL are posted at our website <http://www.bhelhwr.co.in> . If any vendor still quotes on other than FOR destination basis then his offer will be loaded by the maximum freight , packing & forwarding charges quoted by any other bidder from the same or nearby station , against the Enquiry/Freight rate available with BHEL . Further non-availability of BHEL approved transporter will not be accepted for rescheduling the delivery or waiver of penalties .

**For Foreign Suppliers** – Foreign vendors should quote on C&F Mumbai basis . The bids will be evaluated on C&F Mumbai basis . The vendor who quotes on other than C&F Mumbai basis then his offer will be loaded by the maximum freight , packing & forwarding charges quoted by any other bidder from same or nearby port , against the Enquiry / Freight rate available with BHEL . Further non-availability of ship will not be accepted for rescheduling the delivery or waiver of penalties .

**1.2.2** Applicable sales Tax, Excise duty and any other statutory levy should be indicated separately and clearly in the quotation, else it will be concluded that the offer is inclusive of all taxes and duties. The comparison between foreign and indigenous bids shall be done on the landed price basis .

### **1.3 Part-III ( Supplier Registration form )**

The SRF duly filled up will be assessed for manufacturing capability , quality systems being followed , organizational soundness and financial worthiness .

**2.2** PART-I containing techno-commercial part and part-III containing supplier registration form will be opened on the date and time specified in the covering letter in the presence of those tenderers who wish to attend.

**2.2.1** The part-II price Bids will be opened at a later date of only those bidders whose techno-commercial bid has been found acceptable. BHEL may go for Reverse Auction with the vendors whose techno-commercial bid has been found acceptable .

## **3.0 MARKING OF ENVELOPE**

**3.1** Part-I , Part-II & Part-III and the envelope containing drafts for EMD and tender fee shall be individually sealed and superscribed as indicated below and shall be enclosed further in the envelope duly sealed and superscribed as "TENDER FOR (ITEM NAME) AGAINST TENDER NO.-----  
DUE ON -----CONTAINING PART-I & PART-II OF THIS OFFER and the name of the bidding company.

**3.2** The following shall be superscribed on the envelopes.

1. EMD (Rs. Fifty thousand ) AND TENDER FEE. ( Rs Two thousand ) :

Details of Drafts attached (No,Bank, Branch, Issue date)

2. PART-I            1. TENDER NO. AND ITEMS DESCRIPTION.  
                             2. DUE DATE FOR OPENING.

3. PART-II            1. TENDER NO. AND ITEMS DESCRIPTION.  
                             2. DUE DATE FOR OPENING OF PART-I.  
                             3."PRICE BID PART-II".

4. Part-III            1. Tender No. and Items description  
                             2. Due date for opening  
                             3. Supplier registration form  
                             (this form can be downloaded from [www.bhel.com](http://www.bhel.com))

5. Name of the bidding company

**3.3** Envelopes not marked as above are liable to be ignored and may not be opened.

**4.1** Tenders when finalized shall be in the name of the bidder only and change of name during tender evaluation (without certificate from registrar of company) and after submission of the tender is liable to make the offer ineligible for participation.

IN CASE YOU ARE NOT MAKING AN OFFER AGAINST THIS ENQUIRY, THEN PLEASE ARRANGE TO SEND A LETTER OF REGRET IF YOU HAVE COLLECTED THE TENDER DOCUMENTS FROM BHEL.

**Thanking You,**

**Yours faithfully,**

**For & on behalf of BHEL, Hardwar.**

**Manager (PPX-F&HE)**

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## ANNEXURE-I

### ACCEPTANCE OF COMMERCIAL TERMS BY VENDOR

| TENDER NO.<br>SL. NO.  | DESCRIPTION | VENDOR'S<br>CONFIRMATION |
|--|-------------|--------------------------|
| 1) <b><u>Payment terms:</u></b><br><b>For Indigenous Vendors :</b> 100% payment against dispatch documents through Bank .<br><b>For Foreign Vendors :</b> 100% payment against shipping documents through Letter of Credit<br>.  |             |                          |
| 2) <b><u>Delivery of the material:</u></b><br><br>- Firm delivery period for the material to be stated w.e.f. date of LOI( Letter of Intent) / Order .<br>- In case deliveries quoted by the vendors are not suiting , BHEL may also ignore the Offer of the vendor  |             |                          |
| 3) <b><u>Liquidated damages:</u></b> L.D. shall be applicable for delayed delivery @ 0.5% per week and part thereof subject to a maximum of 10% for total P.O. value. BHEL may load maximum penalty under LD clause , to the extent the same is not agreed by the vendor , for the purpose of comparative statement. |             |                          |

|   |  |
|---|--|
| <p><b>4) <u>Submission of the Quality Plan :</u></b></p> <p><b>Vendor shall submit Quality Plan on enclosed BHEL Q.P. Format for review &amp; approval of BHEL .</b></p> <p><b>- For Indigenous Vendors :</b> Preinspection at vendor's works shall be done by BHEL / PDIL for witnessing as per BHEL Haridwar approved Quality Plan .</p> <p><b>- For Foreign Vendors :</b> Preinspection at vendor's works shall be done by M/S LLOYDs for witnessing as per BHEL Haridwar approved Quality Plan .</p> <p>M/S PDIL &amp; M/S LLOYDs inspection will be arranged by BHEL , and the rate quoted by the supplier should exclude the PDIL / LLOYDs inspection charges .</p> |  |
| <p><b>5) <u>Settlement of Disputes:</u></b></p> <ul style="list-style-type: none"> <li>• Settlement of disputes through arbitration shall be in accordance with Arbitration Rules of Conciliation and Arbitration of the ICC, Paris. The venue of arbitration shall be Delhi. The courts of Delhi shall have exclusive jurisdiction.</li> <li>• For Indigenous Source. The venue of arbitration shall be Haridwar Courts, which will have exclusive jurisdiction.</li> </ul>  |  |
| <p><b>6) <u>Consent for Reverse Auction</u></b></p> <p>BHEL may go for Reverse Auction with the bidders whose Techno-commercial offers have been accepted by BHEL .</p>   |  |
| <p><b>7) <u>Drawing / data approval</u></b></p> <p>Any drawing / data approval required from BHEL after placement of order shall be the responsibility of the vendor and any delay on account of the same shall be the responsibility of the vendor and have no bearing on the penalty applicable.</p>  |  |
| <p><b>8) <u>Drawing / design / information use:</u></b></p> <p>The vendor will have to give an undertaking that the drawing / design / Information enclosed with the enquiry / proposed order will not be parted to any other agency and will also not be used for manufacturing for any other customer.</p>  |  |
| <p><b>9) <u>Warranty/ Guarantee:</u></b> 18 months from the date of despatch or 12 months from the date of commissioning whichever is later .</p>   |  |

|   |  |
|---|--|
| <b>10)</b> Details of Contact person Name, Designation, Department complete postal, E-mail address & Fax no, phone, Mobile no. to be mentioned.   |  |
| <b>11)</b> Phyto sanitary Certificate essential for packages (Wooden).  |  |
| <b>12) Validity:</b> Validity of the offer should be 90 days from tender opening.   |  |
| <b>13) Risk Purchase:</b> In case of delays in supplies / defective supplies or non-fulfillment of any other terms and conditions given in the Purchase Order , BHEL may cancel the Purchase Order in full or part thereof , and may also make the purchase of such material from elsewhere / alternative source at the risk and cost of the supplier . |  |
| <b>Note:</b> Attach separate sheet for additional information if necessary.<br>The above terms & condition supersedes the terms & conditions found contradictory written else where in the tender enquiry.  |  |



**PRICE SCHEDULE****ANNEXURE-II**

| SL. No. | DESCRIPTION  | PRICE IN (RS. / CURRENCY) |
|---------|--|---------------------------|
| 1.1     | MATERIAL (TUBE) COST AS PER TECH. SPECIFICATION<br>( <b>INDIGENOUS VENDORS</b> SHOULD QUOTE ON FOR STORES HEEP BHEL HARIDWAR BASIS & <b>FOREIGN VENDORS</b> SHOULD QUOTE ON C&F MUMBAI BASIS )<br>PLEASE ATTACH UNPRICED COPY OF YOUR PRICE BID. | -----                     |
| 1.2     | PACKING CHARGES ( if applicable )  | -----                     |
| 1.3     | FORWARDING CHARGES ( if applicable )   | -----<br>-----            |
|         | TOTAL  | -----                     |

- 2.0 Total weight -- /Gross / Net in Kg. & also package size should be indicated if not exact then approximate.
- 3.0 **Excise duty:** Rate of Excise Duty & Concession forms requirements etc. to be stated wherever applicable.
- 4.0 **Sales Tax:** Rate of Sales Tax & Concession forms requirements etc. to be stated wherever applicable.

**NOTE:**

1. BHEL will evaluate the technical bids against essential criteria/requirements. BHEL may seek clarifications, if required, from the qualified bidders only. These clarifications will be communicated to the eligible vendors and they will be asked to attend techno-commercial discussions on specified dates. The bidders will be given 15 days notice to come prepared with the required documents/ clarifications. No extension will be given. **The offers of those bidders, who are unable to respond in this time frame, are likely to be ignored.**
2. BHEL may go for Reverse Auction with the bidders whose Offers have been accepted by BHEL .

**Date****(Signature)****Name****Designation****Department****M/S**

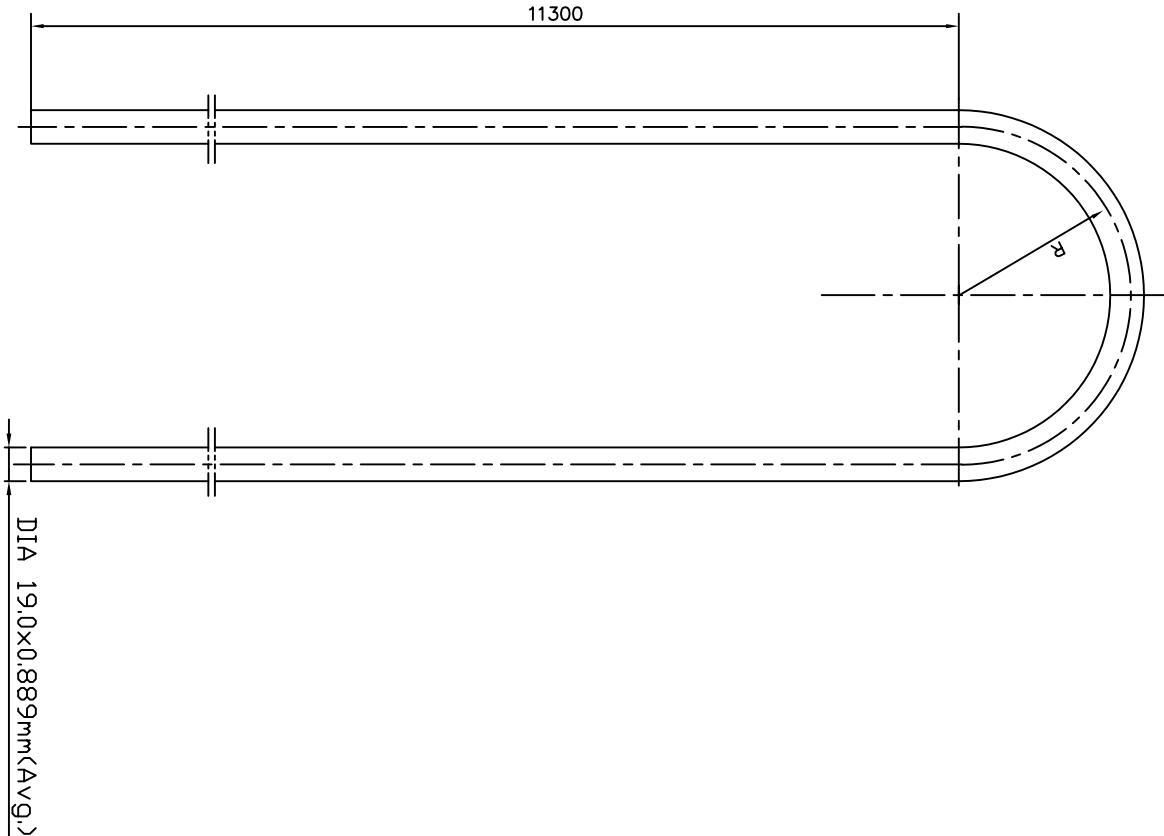
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अभिकल्प संख्या / DRAWING NO.

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INTEREST OF THE COMPANY.

स्वत्वाधिकार एवं गोपनीय

इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स लिमिटेड की सम्पत्ति है। इसका प्रत्यक्ष या अप्रत्यक्ष रूप में किसी भी तरह प्रयोग नहीं किया जाए जो कम्पनी के हित में हानिकार हो।



NOTES:-


TOTAL TUBES = 740

TOTAL WT. = 6970.80 Kgs.


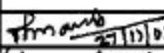
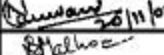
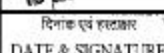
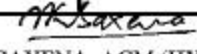
MATERIAL SPECIFICATION: – HE 57034, TP: 304

| VAR | ROW<br>SL.NO. | QTY.<br>OF<br>TUBE | R     | MATERIAL<br>CODE | WT. OF<br>EACH TUBE<br>IN (Kg.) |
|-----|---------------|--------------------|-------|------------------|---------------------------------|
| 00  | 01            | 35                 | 38.0  | W96716220160     | 9.13                            |
| 01  | 02            | 41                 | 58.8  | W96716220178     | 9.21                            |
| 02  | 03            | 40                 | 79.6  | W96716220186     | 9.24                            |
| 03  | 04            | 39                 | 100.3 | W96716220194     | 9.27                            |
| 04  | 05            | 40                 | 121.1 | W96716220208     | 9.29                            |
| 05  | 06            | 41                 | 141.9 | W96716220216     | 9.32                            |
| 06  | 07            | 40                 | 162.7 | W96716220224     | 9.35                            |
| 07  | 08            | 39                 | 183.5 | W96716220232     | 9.38                            |
| 08  | 09            | 40                 | 204.3 | W96716220240     | 9.40                            |
| 09  | 10            | 39                 | 225.1 | W96716220259     | 9.43                            |
| 10  | 11            | 38                 | 245.8 | W96716220267     | 9.46                            |
| 11  | 12            | 37                 | 266.6 | W96716220275     | 9.48                            |
| 12  | 13            | 36                 | 287.4 | W96716220283     | 9.51                            |
| 13  | 14            | 33                 | 308.2 | W96716220291     | 9.54                            |
| 14  | 15            | 32                 | 329.0 | W96716220305     | 9.56                            |
| 15  | 16            | 31                 | 349.8 | W96716220313     | 9.59                            |
| 16  | 17            | 30                 | 370.5 | W96716220321     | 9.61                            |
| 17  | 18            | 27                 | 391.3 | W96716220330     | 9.64                            |
| 18  | 19            | 26                 | 412.1 | W96716220348     | 9.67                            |
| 19  | 20            | 23                 | 432.9 | W96716220356     | 9.69                            |
| 20  | 21            | 19                 | 453.7 | W96716220364     | 9.72                            |
| 21  | 22            | 13                 | 474.5 | W96716220372     | 9.77                            |


|  |                                  |   |                            |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |
|--|----------------------------------|---|----------------------------|--|---------------------------------------|-------------|--|-----------------------------|-----------|----------------------|--------------|------------------|---------|----|---------|--|--|--|--|--|--|--|--|----------------|----------------|--------------------------|--|--|--|--------------|--|
| सामग्री सूची संख्या<br>INVENTORY NO.   | हस्ताक्षर और दिनांक /SIGN & DATE | संदर्भित अभिकल्प संख्या<br>REFERENCE DRG. NO. |                            |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |
| <div>NOTES:—</div> <div>TOTAL TUBES = 740</div> <div>TOTAL WT. = 6970.80 Kgs.</div> <div>MATERIAL SPECIFICATION:— HE 57034, TP: 304</div>  |                                  |   |                            |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |
| <table><tr><td colspan="2">श्री. वी. ओ. एम. /C.B.O.M.</td><td rowspan="2">श्रीमत्पुत्र का लाल<br/>STATUS OF DRG.</td></tr><tr><td colspan="2">11621870049</td></tr><tr><td>मंजूर विभाग<br/>AGREED DEPT.</td><td>नाम /NAME</td><td>हस्ताक्षर /<br/>SIGN.</td><td>दिनांक /DATE</td></tr><tr><td>वेल्डिंग टेक्नो.</td><td>आई. राम</td><td>ह.</td><td>2/11/05</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td colspan="4"></td></tr><tr><td>संशोधन<br/>REV.</td><td>दिनांक<br/>DATE</td><td colspan="2">संशोधकर्ता<br/>ALTERED BY</td></tr><tr><td></td><td></td><td colspan="2">जयवंत<br/>CHD</td></tr></table> |                                  |   | श्री. वी. ओ. एम. /C.B.O.M. |  | श्रीमत्पुत्र का लाल<br>STATUS OF DRG. | 11621870049 |  | मंजूर विभाग<br>AGREED DEPT. | नाम /NAME | हस्ताक्षर /<br>SIGN. | दिनांक /DATE | वेल्डिंग टेक्नो. | आई. राम | ह. | 2/11/05 |  |  |  |  |  |  |  |  | संशोधन<br>REV. | दिनांक<br>DATE | संशोधकर्ता<br>ALTERED BY |  |  |  | जयवंत<br>CHD |  |
| श्री. वी. ओ. एम. /C.B.O.M.   |                                  | श्रीमत्पुत्र का लाल<br>STATUS OF DRG.         |                            |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |
| 11621870049  |                                  |   |                            |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |
| मंजूर विभाग<br>AGREED DEPT.  | नाम /NAME                        | हस्ताक्षर /<br>SIGN.                          | दिनांक /DATE               |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |
| वेल्डिंग टेक्नो.   | आई. राम                          | ह.  | 2/11/05                    |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |
|  |                                  |   |                            |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |
|  |                                  |   |                            |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |
| संशोधन<br>REV.   | दिनांक<br>DATE                   | संशोधकर्ता<br>ALTERED BY                      |                            |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |
|  |                                  | जयवंत<br>CHD                                  |                            |  |                                       |             |  |                             |           |                      |              |                  |         |    |         |  |  |  |  |  |  |  |  |                |                |                          |  |  |  |              |  |


|  |  |   |  |   |  |   |  |                                    |  |
|--|--|---|--|---|--|---|--|------------------------------------|--|
| उत्पाद का प्रकार या ग्राहक/परियोजना का नाम<br>TYPE OF PRODUCT OR NAME OF<br>CUSTOMER/PROJECT             |  |   |  |   |  |   |  |                                    |  |
| भारत हेवी इलेक्ट्रिकल्स लिमिटेड, रानीपुर, हरिद्वार<br>BHARAT HEAVY ELECTRICALS LIMITED, RANIPUR, HARDWAR |  |   |  |   |  |   |  |                                    |  |
| बीएसईएल<br>BSI   |  | विभाग    हौट एक्सचेंजर अभि.<br>DEPT.        HXE                                     |  | अनुपात/SCALE<br>N. T. S.                  |  | भार कि. ग्रा.<br>WEIGHT (KG)                                    |  | नॉ की संख्या<br>NO. OF ITEMS       |  |
| कोड/ /CODE 42222   |  |  |  | SEE TABLE                                 |  | असेम्बली अभिकल्प का संदर्भ<br>REFER TO ASSLY. DRG.<br>116218700 |  | 01-22                              |  |
| शीर्षक/TITLE<br><br>U-TUBE   |  | कार्ड कोड<br>CARD CODE  |  | अभिकल्प संख्या/DRAWING NO.<br>31621870250 |  | पृष्ठ संख्या/Sheets No. 01                                      |  | पृष्ठों की संख्या/No. of Sheets 01 |  |

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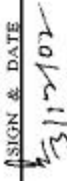
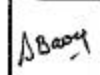

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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE  |    | उत्पाद मानक<br>PRODUCT STANDARD   | HE57034  |            |
|  |  |   | पृष्ठ 19 का 1<br>Page 1 of 19  |            |
| SUPERSTORES<br>INVENTORY   | <p align="center"><b>U—BENT WELDED AUSTENITIC STAINLESS STEEL—FEED WATER TUBES</b><br/>(Gr- 304 / Gr- 316)</p>   |   |  |            |
| जारी की गई<br>उत्पन्न की   | <p><b>1.0 GENERAL :</b></p> <p>This specification covers the quality of Welded / Welded &amp; drawn austenitic stainless steel feed water heater tubes in U- bent shape from 15 mm to 25.4 mm in diameter.</p>   |   |  |            |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of this company. | <p><b>2.0 APPLICATION:</b></p> <p>For use in feed water heaters.</p>   |   |  |            |
|  | <p><b>3.0 CONDITION OF DELIVERY:</b></p> <p>The tubes shall be furnished in the heat treated condition as per clause 7.2 and shall be free from scale.</p>   |   |  |            |
|  | <p><b>4.0 COMPLIANCE WITH NATIONAL / INTERNATIONAL STANDARD :</b></p> <p>There is no Indian standard covering this material. However, this specification is based on ASME SA 688.</p>  |   |  |            |
| स्वयंसाधिकाएँ एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है। इसका प्रयोग एवं प्रसारण केवल ही इसी उद्देश्य के लिए ही किया जाना है। अन्यथा इससे किसी भी तरह का नुकसान हो सकता है।        | <p><b>5.0 DIMENSIONS AND TOLERANCES:</b></p> <p><b>5.1 SIZE:</b></p> <p>The tubes shall be supplied to the dimensions specified in the purchase order. The enclosed drawing of U-bent tube may be referred for various terminologies used in this specification.</p> |   |  |            |
| दिनांक एवं हस्ताक्षर<br>SIGN & DATE<br>31/12/02  | नाम<br>NAME  | दिनांक एवं हस्ताक्षर<br>SIGNATURE & DATE  |  |            |
| HXE  | N.P. MATHUR  |  | अनुवादक TRANSLATED BY  |            |
| QAX  | N. K. Manwani  |  | निरीक्षणकर्ता WORKED BY  | S.K.BAVEJA |
| TSX  | L.B. MALHOTRA  |  | जांचकर्ता CHECKED BY   | S.K.BAVEJA |
| सहमत विभाग<br>AGREED DEPTT   | नाम<br>NAME  | दिनांक एवं हस्ताक्षर<br>DATE & SIGNATURE  | पर्यवेक्षणकर्ता SUPERVISED BY  | S.BARAI    |
| स्वीकृति<br>APPROVED : V.K.SAXENA, AGM (HXE)   |  |   |  |            |
| रिवीजन<br>REV.NO 04  | जारी<br>ISSUED : HXE   | दिनांक<br>DATE : 22-8-88  |  |            |
| दिनांक<br>Dt 15-12-03  |  |   |  |            |

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|--|--|---|--|---|--|
| दिनांक एवं हस्ताक्षर<br>SIGN & DATE  |  | उत्पाद मानक<br><b>PRODUCT STANDARD</b>  |  | <b>HE57034</b><br>पृष्ठ 19 का 2<br>Page 2 Of 19                   |  |
| सुपरसेडिंग<br>INVENTORY  |  | <b>5.2</b> The tolerances on outside diameter, wall thickness, length, squareness of ends, leg spacing etc. shall comply with the following:  |  |   |  |
| संशुद्धि एवं<br>संशोधन   |  | <b>5.2.1 TOLERANCES ON OUTSIDE DIAMETER : (STRAIGHT PORTION)</b>  |  |   |  |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. |  | Specified out—side<br>diameter. (mm)<br>Up to 25.4 mm   |  | Tolerance on specified<br>outside diameter, (mm)<br>$\pm 0.10$ mm |  |
|  |  | <b>5.2.2 TOLERANCE ON OUTSIDE DIAMETER : ( BENT PORTION)</b><br>Neither the major nor minor diameter of the tube shall deviate from the nominal diameter by more than 10%.  |  |   |  |
|  |  | <b>5.2.3 TOLERANCE ON WALL THICKNESS :</b>  |  |   |  |
| स्वामित्व अधिकार एवं गोपनीय<br>इस प्रयोग में की गई सुझाव वाला किसी इलेक्ट्रिकल की सुरक्षा है इसका प्रयोग एवं<br>आचरण को के किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए ।                       |  | <b>5.2.3.1 TOLERANCE ON U- BENT PORTION:</b><br>Tube wall thickness in U- bent section shall not be less than the value determined by the equation :-<br>$t_f = 4RT / (4R+D).$<br>$t_f$ = Wall thickness after bending (mm).<br>$T$ = Minimum wall thickness of clause 5.2.3.2 (mm)<br>$R$ = Centre line bend radius (mm).<br>$D$ = Nominal outside tube diameter (mm). |  |   |  |
| दिनांक एवं हस्ताक्षर<br>SIGN & DATE<br>29/10/02  |  | <b>5.2.3.2 TOLERANCE ON STRAIGHT PORTION:</b><br>Wall thickness tolerance shall be $\pm 10\%$ of nominal wall thickness<br><b>NOTE:-</b><br><b>"TOLERANCE SHALL BE AS PER CL. 5.2.3.2 UNLESS SPECIFIED OTHERWISE IN THE DRAWING"</b>  |  |   |  |
| सुपरसेडिंग<br>INVENTORY NO.<br><b>P-5759</b>   |  | REV.NO.<br><b>04</b>  |  | निर्माणकर्ता<br>WORKED BY<br>S.K.BAVEJA<br>29-10-02               |  |
|  |  |   |  | जांचकर्ता<br>CHECKED BY<br>S. SARAI<br>29.10.02                   |  |


| निमनक एवं दिनांक<br>SIGN & DATE  |  | उत्पाद मानक<br><br><b>PRODUCT STANDARD</b>  | <b>HE57034</b><br>पृष्ठ 19 का 3<br>Page 3 Of 19 |          |                 |                      |                    |      |                               |      |              |     |
|--|--|---|---|----------|-----------------|----------------------|--------------------|------|-------------------------------|------|--------------|-----|
| निमनक एवं दिनांक<br>SIGN & DATE  | SUPERSEDES<br>INVENTORY  | <b>5.2.3 PERMISSIBLE VARIATION FROM SPECIFIED LENGTH:</b><br><br>The length of the tube legs as measured from the point of tangency of the bend to the end of the tube leg, shall not be less than specified, but may exceed up to the values given below:  |   |          |                 |                      |                    |      |                               |      |              |     |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. |  | <table border="1"> <thead> <tr> <th>Leg length, (m)</th><th>Plus tolerance, (mm)</th></tr> </thead> <tbody> <tr> <td>To 6.0, excluding.</td><td>3.2</td></tr> <tr> <td>6.0 to 9.0, excluding</td><td>4.0</td></tr> <tr> <td>9.0 to 12.0.</td><td>4.8</td></tr> </tbody> </table> <p>NOTE : The difference in length of the tube legs of each tube shall not be greater than 3 mm.</p> |   |          | Leg length, (m) | Plus tolerance, (mm) | To 6.0, excluding. | 3.2  | 6.0 to 9.0, excluding         | 4.0  | 9.0 to 12.0. | 4.8 |
| Leg length, (m)  | Plus tolerance, (mm)   |   |   |          |                 |                      |                    |      |                               |      |              |     |
| To 6.0, excluding.   | 3.2  |   |   |          |                 |                      |                    |      |                               |      |              |     |
| 6.0 to 9.0, excluding  | 4.0  |   |   |          |                 |                      |                    |      |                               |      |              |     |
| 9.0 to 12.0.   | 4.8  |   |   |          |                 |                      |                    |      |                               |      |              |     |
| स्वतन्त्राधिकार एवं गोपनीय<br>इस दस्तावेज में दी गई प्रतिलिपि भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं प्रसारण के बिना की जाने वाली ग्राहक को नुकसान हो सकता है।                                       |  | <b>5.2.4 TOLERANCE ON SQUARENESS OF ENDS:</b><br><br>The end of any tube may depart from square by not more than the amount given below:  |   |          |                 |                      |                    |      |                               |      |              |     |
| निमनक एवं दिनांक<br>SIGN & DATE  |  | <table border="1"> <thead> <tr> <th>Tube OD (mm)</th><th>Tolerance (mm)</th></tr> </thead> <tbody> <tr> <td>Upto 16, Including</td><td>0.25</td></tr> <tr> <td>Above 16 upto 25.4, Including</td><td>0.41</td></tr> </tbody> </table>   |   |          | Tube OD (mm)    | Tolerance (mm)       | Upto 16, Including | 0.25 | Above 16 upto 25.4, Including | 0.41 |              |     |
| Tube OD (mm)   | Tolerance (mm)   |   |   |          |                 |                      |                    |      |                               |      |              |     |
| Upto 16, Including   | 0.25   |   |   |          |                 |                      |                    |      |                               |      |              |     |
| Above 16 upto 25.4, Including  | 0.41   |   |   |          |                 |                      |                    |      |                               |      |              |     |
| निमनक एवं दिनांक<br>SIGN & DATE  | REV.NO.<br><br><b>04</b>   | <b>5.2.5 TOLERANCE ON LEG SPACING :</b><br><br>The leg spacing measured between the point of tangency of the bend to the legs shall not vary the value ( 2R – Specified tube outside diameter) by more than 1.6 mm where 'R' is centre line bend radius.  |   |          |                 |                      |                    |      |                               |      |              |     |
| निमनक एवं दिनांक<br>SIGN & DATE  | INVENTORY NO.<br><b>P-5759</b>   | निर्माणकर्ता<br>WORKED BY   | S.K.BAVEJA                                      | 29.10.02 |                 |                      |                    |      |                               |      |              |     |
|  |  | जाँचकर्ता<br>CHECKED BY   | S.BARAI   | 29.10.02 |                 |                      |                    |      |                               |      |              |     |


|                                     |  |   |            |                              |  |
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| निर्माण एवं इस्तेमाल<br>SIGN & DATE |  | उत्पाद मानक<br><br>PRODUCT STANDARD   |            | HE57034                      |  |
|                                     |  |   |            | पृष्ठ 19 क 4<br>Page 4 Of 19 |  |
| सामग्री सूची<br>INVENTORY NO.       | सुपरसेड<br>SUPERSEDES<br>INVENTORY   | <p>5.2.6 <b><u>TOLERANCE ON UNIFORMITY IN CURVATURE :</u></b><br/>The bent portion of the 'U' tube shall be substantially uniform in curvature and not to exceed 1.6 mm of nominal centre line radius.</p> <p>5.2.7 <b><u>TOLERANCE ON PLANE OF BEND :</u></b><br/>Permissible deviation from the plane of bend shall not exceed 1.6 mm as measured from the point of tangency.</p> <p>5.2.8 <b><u>SEAM HEIGHT :</u></b><br/>The projection of weld seam inside the tube shall not be more than 0.05 mm.</p> <p>6.0 <b><u>PROCESS :</u></b></p> <p>6.1 <b><u>MATERIAL:</u></b><br/>The steel shall be made by the electric furnace process or other primary process approved by B.H.E.L . The primary melting may incorporate separate degassing or refining and may be followed by secondary re-melting. If secondary melting is employed , the heat shall be defined as all of the ingots re-melted from a single primary heat. The type of melting to be used shall be indicated by the manufacturer.</p> <p>7. <b><u>MANUFACTURE:</u></b></p> <p>7.1 <b><u>STARIGHT TUBE :</u></b></p> <p>7.1.1 The tubes shall be made from flat steel by an automatic welding process with no addition of filler metal.</p> |            |                              |  |
| सामग्री सूची संख्या<br>P-5759       | सामग्री सूची संख्या<br>04  | निर्माणकर्ता<br>WORKED BY   | S.K.BAVEJA | 29.10.02                     |  |
|                                     |  | जांचकर्ता<br>CHECKED BY   | S.BARAI    | 29.10.02                     |  |



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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE  |  | उत्पाद मानक<br><br><b>PRODUCT STANDARD</b>  | <b>HE57034</b><br>पृष्ठ 19 का 5<br>Page 5 Of 19   |  |
| सुपरसेड्स<br>INVENTORY   | समीचीन सुची<br>रखना से   | 7.1.2 Subsequent to welding and prior to heat treatment (Straight tubes) the tubes shall be cold worked either in both weld and base metal or in weld metal only. The method of cold working shall be got approved from BHEL. When cold drawn, the amount of reduction in area shall not be less than 20% .   |   |  |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.                                     |  | 7.1.2.1 <b>CLEANING BEFORE ANNEALING :</b><br><br>All lubricants or coating used in the manufacture of straight length tube or in the bending shall be removed from all surfaces prior to any annealing treatment, U-bends on which a lubricant had been applied to the inside surface during bending shall have the cleanliness of their inside surface confirmed by blowing close fitting acetone soaked felt plugs through 10% of the tubes of each bend radius. Dry (oil free) air or inert gas shall be used to blow the plugs through the tubes. If the plugs blown through tubes show more than a light gray discolouration, all tubes that have had lubricant applied to the inside surface during bending shall be re-cleaned. After re-cleaning, 10 % of the tubes of each bend radius whose inside surface had been subjected to bending lubricants, shall be re-tested. |   |  |
| स्वाधिकार एवं गोपनीय<br>इस दस्तावेज में दी गई सुचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं प्रसारण केवल केवल ही की शर्त पर ही किया जा सकता है अन्यथा इसके बिना किसी भी प्रकार का प्रयोग, जो कि कंपनी के हित में हानिकारक हो न दिया जाए । |  | 7.1.3 <b>HEAT TREATMENT-STRAIGHT TUBE :</b><br><br>Material shall be heat treated by heating it to temperature of 1040°C -1100°C, quenching in water or rapidly cooling by other means to avoid carbide precipitation. The method of heat treatment must be got approved from BHEL.<br><br>The tubes after final heat treatment, shall be pickled using a solution of nitric and hydrofluoric acids followed by flushing and rinsing in water. If bright annealing is performed then this requirement does not apply.   |   |  |
| दिनांक एवं हस्ताक्षर<br>SIGN & DATE<br>   | 3/12/02  |   |   |  |
| समीचीन सुची नम्बर<br>INVENTORY NO.<br><b>P-5759</b>  | REV.NO.<br><br><b>04</b>   |   | अंमोदितकर्ता<br>WORKED BY   | S.K.BAVEJA<br> 29.10.02 |
|  |  | जांचकर्ता<br>CHECKED BY   | S.BARAI<br> 29.10.02 |  |



|   |   |   |               |  |  |                               |  |
|---|---|---|---------------|--|--|-------------------------------|--|
| निर्माण एवं प्रयोग<br>SIGN & DATE   |   |   |               | उत्पाद मानक<br><b>PRODUCT STANDARD</b> |  | HE57034                       |  |
| सुपरसिडर<br>INVENTORY NO.   |   | सापेक्षी सूची<br>शेता सं.   |               |  |  | पृष्ठ 19 का 6<br>Page 6 Of 19 |  |
| स्वत्वधिकार एवं गोपनीय<br>इस प्रलेख में की गई सूचना भारत देशी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं<br>अन्यथा रूप से किसी भी तरह प्रसारण, जो कि कंपनी को रिया के हितोंकरके हो स किता जाए । |   | COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.  |               |  |  |                               |  |
|   |   | <p><b>7.2 U - TUBES:</b></p> <p>7.2.1 Tubes shall be bent by using cold working methods. Hot bending process shall not be acceptable.</p> <p>NOTE: Drawing and bending lubricants shall not contain more than 50 ppm chloride.<br/>Each cleaning operation shall be followed by rinse or rinses.</p> <p><b>7.2.2 HEAT TREATMENT OF U- BENT TUBES:</b></p> <p>U-bends shall be heat treated. The annealing procedure shall be adopted as specified in clause 7.1.3 however a light oxide scale on outside surface of U-bend area shall be permitted for tubes which have been electric resistance heat treated after bending.</p> <p>7.2.2.1 The heat treatment shall be applied to the U-bend area plus approximately 150mm on each side beyond the tangent point of the U-bend.</p> <p>7.2.2.2 The inside of the tube shall be purged with a protective or inert gas atmosphere during heating and cooling below 700 ° F (370 °C ) to prevent scaling of the inside surface. The atmosphere should be noncarburizing</p> <p>7.2.2.3 Temperature control shall be accomplished through the use of optical or emission pyrometers or both. No temperature indicating crayons, lacquers or pellets shall be used.</p> |               |  |  |                               |  |
| निर्माण एवं प्रयोग<br>SIGN & DATE<br>31/10/02   | निर्माणकर्ता<br>WORKED BY<br>S.K.BAVEJA | जांचकर्ता<br>CHECKED BY<br>S.BARAI  | REV.NO.<br>04 | INVENTORY NO.<br>P-5759                |  |                               |  |
|   |   |   |               | 29-10-02<br>29.10.02                   |  |                               |  |

|  |            |   |          |  |  |   |  |                           |            |          |          |                         |         |        |          |
|--|------------|---|----------|--|--|---|--|---------------------------|------------|----------|----------|-------------------------|---------|--------|----------|
| दिनांक एवं हस्ताक्षर<br>SIGN & DATE  |            |   |          | उत्पाद मानक<br><b>PRODUCT STANDARD</b>   |  | <b>HE57034</b><br>पृष्ठ 19 का 7<br>Page 7 of 19 |  |                           |            |          |          |                         |         |        |          |
| शीर्षक एवं संख्या<br>SUPERSEDES<br>INVENTORY   |            | 7.2.2.4 The bent portion plus not less than 300 mm of each straight length shall be cleaned prior to annealing. If annealing is by electric resistance method, no arc burns or copper deposits from clamps will be allowed.   |          |  |  |   |  |                           |            |          |          |                         |         |        |          |
| कॉपी की संख्या<br>संख्या में   |            | 8.0 <b><u>FREEDOM FROM DEFECTS:</u></b><br><br>8.1 Finished tubes shall have smooth ends free from burrs. Tubes shall be free from cracks, undercuts, seams, scale, deleterious films in the bore & other harmful defects. The tubes shall not have wrinkles on its surfaces. |          |  |  |   |  |                           |            |          |          |                         |         |        |          |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. |            | 8.2 <b><u>INSIDE SURFACE FINISH</u></b> :<br><br>For the inner surface, with the exception of weld seam, the roughness in longitudinal direction shall be allowable within Ra=2 microns or Rz = 10 microns.   |          |  |  |   |  |                           |            |          |          |                         |         |        |          |
| स्वतंत्र अधिकार एवं गोपनीय<br>इस प्रलेख में दी गई जानकारी भारत भारी इलेक्ट्रिकल्स की संपत्ति है। इसका प्रयोग एवं प्रसारण के बिना की जाने वाली प्रतियोगिता, जो कि कंपनी के हित में है, नकारात्मक हो न सके।            |            | 8.3 <b><u>STRAIGHTNESS</u></b> :<br><br>The leg length of the finished tube shall not deviate from straightness by more than 0.75 mm in 900 mm length.  |          |  |  |   |  |                           |            |          |          |                         |         |        |          |
| दिनांक एवं हस्ताक्षर<br>SIGN & DATE<br>31/10/02  |            |   |          |  |  |   |  |                           |            |          |          |                         |         |        |          |
| शीर्षक एवं संख्या<br>INVENTORY NO.<br>P-5759   |            | REV.NO.<br>04   |          | <table border="1"> <tr> <td>निर्माणकर्ता<br/>WORKED BY</td> <td>S.K.BAVEJA</td> <td>S.Baveja</td> <td>29.10.02</td> </tr> <tr> <td>जांचकर्ता<br/>CHECKED BY</td> <td>S.BARAI</td> <td>S.Bara</td> <td>29.10.02</td> </tr> </table> |  |   |  | निर्माणकर्ता<br>WORKED BY | S.K.BAVEJA | S.Baveja | 29.10.02 | जांचकर्ता<br>CHECKED BY | S.BARAI | S.Bara | 29.10.02 |
| निर्माणकर्ता<br>WORKED BY  | S.K.BAVEJA | S.Baveja  | 29.10.02 |  |  |   |  |                           |            |          |          |                         |         |        |          |
| जांचकर्ता<br>CHECKED BY  | S.BARAI    | S.Bara  | 29.10.02 |  |  |   |  |                           |            |          |          |                         |         |        |          |

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उत्पाद मानक

HE57034

पृष्ठ 19 क 8

## PRODUCT STANDARD

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SUPERSEDES  
INVENTORYसमय की सीमा  
हस्ताक्षर

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स्वत्वधिकार एवं गोपनीय

इस प्रलेख में दी गई सूचना भारत भारती इलेक्ट्रिकल्स की संपत्ति है। इसका प्रयोग एवं  
अपवाद रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न सके।

दिनांक एवं हस्ताक्षर  
SIGN & DATEसमय की सीमा  
INVENTORY NO.9.0 CHEMICAL COMPOSITION:

The analysis of material shall be as follows :

| Element     | Weight Percent<br>GR 316 |       | Weight percent<br>GR 304 |       |
|-------------|--------------------------|-------|--------------------------|-------|
|             | Min                      | Max   | Min                      | Max   |
| Carbon      | -                        | 0.05  | -                        | 0.05  |
| Manganese   | -                        | 2.00  | -                        | 2.0   |
| Phosphorous | -                        | 0.040 | -                        | 0.040 |
| Sulphur     | -                        | 0.030 | -                        | 0.030 |
| Silicon     | -                        | 0.75  | -                        | 0.75  |
| Nickel      | 10.00                    | 14.00 | 8.00                     | 11.00 |
| Chromim     | 16.00                    | 18.00 | 18.00                    | 20.00 |
| Molybdenum  | 2.00                     | 3.00  | -                        | -     |

NOTE: In test certificate, composition of trace elements shall also be specified.

10. MECHANICAL PROPERTIES :10.1 TENSILE TEST

Material of tube shall conform to the following tensile properties;

Ultimate tensile strength - 52.0 Kgf/mm<sup>2</sup> (min)Yield strength - 21.0 Kgf/mm<sup>2</sup> (min)

Elongation on 50 mm gauge length - 35 % min

REV.NO.

04

निर्माणाकर्ता

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S.K.BAVEJA

S.K. Baveja

29.10.02


जांचकर्ता

CHECKED BY

S.BARAI

S. Barai

29.10.02

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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE  |    | उत्पाद मानक<br><br><b>PRODUCT STANDARD</b> |   | <b>HE57034</b><br>पृष्ठ 19 का 9<br>Page 9 of 19 |                      |
| सामग्री सूची<br>INVENTORY  | 10.2 <b>HARD NESS</b> : B-90 Rockwell Number Maximum or equivalent.   |  |   |   |                      |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. | 11. <b>TEST SAMPLE</b><br><br>11.1 <b>HEAT ANALYSIS</b> :<br>An analysis of each heat of steel shall be made by the steel manufacture to determine the percentage of the elements specified in clause 9 of this specification. If the secondary melting process of clause-6 is employed, the heat analysis shall be obtained from one re-melted ingot of the product of one re-melted ingot of each primary melt. The chemical composition thus determined shall conform to the requirements specified in clause-9<br><br>11.2 <b>PRODUCT ANALYSIS</b> :<br>An analysis of either one length of flat rolled stock or one tube shall be made of each heat. The chemical composition thus determined shall conform to the requirements specified in clause-9. |  |   |   |                      |
| स्वत्साधिकार एवं गोपनीय<br>इस दस्तावेज में दी गई सूचना भारत भारती इलेक्ट्रिकल लिमिटेड की संपत्ति है। इसका प्रयोग एवं आशयका केवल के बिना की जाये, जो कि भारत भारती इलेक्ट्रिकल लिमिटेड के हित में है।                 | 11.2.1 If the original test for the product analysis fails, retest of two additional lengths of flat rolled stock or tubes shall be made. Both retests for the element in question shall meet the requirements of the of the specification otherwise all remaining material in the heat or lot will be rejected or at the option of the producer, each length of flat rolled stock or tube may be individually tested for acceptance. Length of flat rolled stock or tubes which do not meet the requirements of the specification shall be rejected.   |  |   |   |                      |
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| सामग्री सूची संख्या<br>INVENTORY NO.<br>P-5759   | REV.NO.<br><br>04   |  | निर्माणकर्ता<br>WORKED BY<br>S.K.BAVEJA | जांचकर्ता<br>CHECKED BY<br>S.BARAI              | 29-10-02<br>29.10.02 |



PRODUCT STANDARD

**11.3 MECHANICAL ANALYSIS:**

One specimen from each lot of not more than 125 tubes shall be taken for all mechanical tests unless specified otherwise. The term lot applies to all tubes prior to cutting of the same nominal diameter and wall thickness which are produced from same heat of steel. When final heat treatment is in batch type furnace a lot shall include only those tubes of the same size and the same heat which are heat treated in the same furnace charge. When the final heat treatment is in a continuous furnace, a lot shall include all tube of same size and heat, heat treated in the same furnace at the same temperature, time, heat and furnace speed.

**12.0 MECHANICAL TEST PROPERTIES:**

**12.1 HARDNESS REQUIREMENTS :**

Material of tube when tested as per ASTM A 370 shall not show hardness more than as specified in clause 10.2 of the specification.

Hardness determination shall be made on specimen from 1% of all finished tubes but in no case less than five tubes. Test shall be conducted on straight length as well as on bend portion.

**12.2 REVERSE BEND TEST:**

When tested in accordance to ASTM A 688 there shall be no evidence of cracks or lack of penetration in the weld, or overlaps resulting from the reduction in thickness of weld areas by cold working.

One reverse bend test shall be made on a specimen from each 460 m equivalent of finished tubing.

REV.NO.

04

निर्माणकर्ता  
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29.10.02


जांचकर्ता  
CHECKED BY

S.BARAI

S. Barai

29.10.02




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| SUPERSEDES<br>INVENTORY   |  | 12.3 <b><u>TENSION TEST :</u></b><br>Tension test shall be made on two specimens from each lot. The test shall be conducted as per ASTM A 370.  |  |   |  |
| सामग्री सूची<br>संख्या को   |  | 12.4 <b><u>FLATTENING TEST:</u></b><br>Flattening test shall be made on specimens from each end of one finished tube, not the one used for the flange test, from each lot. The test shall be conducted as per ASTM A 450.   |  |   |  |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.         |  | 12.5 <b><u>FLANGE TEST :</u></b><br>One flange test shall be made as per ASTM A 450 on specimens from each end of one finished tube not the one used for the flattening test, from each lot.  |  |   |  |
| स्वत्वधिकार एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत भारती इंटरनैशनल प्राइवेट लिमिटेड की संपत्ति है इसका प्रयोग एवं प्रसारण के बिना लिखित अनुमति के बिना नहीं किया जाएगा, जो कि कंपनी के हित में हानिकारक हो न किया जाए । |  | 13.0 <b><u>MICROSTRUCTURE:</u></b><br>One microstructure test shall be made on one specimen per heat of finished tube for harmful undesirable metallurgical phases and structure. Manufacturer shall furnish the photographs showing microstructure both on base metal and weld.  |  |   |  |
| निम्न एवं तिथि<br>SIGN & DATE<br>2/11/02  |  | 14.0 <b><u>INTERGRANULAR SUSCEPTIBILITY TEST:</u></b><br>One intergranular test shall be made on one specimen per heat of the finished tube covering the weldment and the parent metal as per ASTM A262 practice E. The specimen bent according to practice E shall not show any sign of fissure either on the weldment or on the parent metal. |  |   |  |
| निम्न एवं तिथि<br>SIGN & DATE<br>2/11/02  |  | 15.0 <b><u>DELTA FERRITE TEST :</u></b><br>Delta ferrite test would be carried out on finish tube on one sample per heat. The control limit would be 1 % on the base metal as well as for weld bead.  |  |   |  |
| निम्न एवं तिथि<br>SIGN & DATE<br>2/11/02  |  | REV.NO.<br>04   |  | निर्मापकर्ता<br>WORKED BY<br>S.K.BAVEJA<br>29.10.02 |  |
| निम्न एवं तिथि<br>SIGN & DATE<br>2/11/02  |  | जांचकर्ता<br>CHECKED BY<br>S.BARAI<br>29.10.02  |  | 5759  |  |

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| SUPERSEDES<br>INVENTORY<br><br>समाप्ति सूची<br>संख्या की  | <p><b>16.0 RESIDUAL STRESSES :</b></p> <p>The residual stresses after bending, heat treatment and straightening shall be kept as low as possible. In any case these shall be limited to 4 Kg / mm<sup>2</sup> (compressive or tensile). The rate of testing should be one test per lot. Procedure for residual stress measurement shall be a BHEL APPROVED method.</p>  |  |                           |   |          |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. | <p><b>17.0 RESIDUAL CHLORIDE TEST:</b></p> <p>The residual chloride salt contamination of the inside and outside surface of the tube at the time of packing for shipment from the mill shall not exceed a concentration of 10.7 mg/m<sup>2</sup> of tube surface. One tube in each five hundred pieces shall be checked immediately prior to packing for shipment for chloride salt contamination by a procedure agreed by BHEL.</p>                  |  |                           |   |          |
| स्वत्वाधिकार एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत भारती इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग अन्य किसी भी उद्देश्य के लिए बिना लिखित अनुमति के नहीं किया जा सकता।  | <p><b>18.0 PRESSURE TESTING:</b></p> <p><b>18.1 HYDROSTATIC TESTING:</b></p> <p>Unless other wise specified each tube shall be subjected to hydrostatic test which shall be carried out as per ASTM A 450.</p> <p><b>18.2 PNEUMATIC TEST:</b></p> <p>If specified, each tube shall be tested at 100 N/cm<sup>2</sup> minimum internal air pressure for 10 seconds as per ASTM A 688 without showing any sign of leakage, while immersed in water.</p> |  |                           |   |          |
| दिनांक एवं हस्ताक्षर<br>SIGN & DATE<br>31/12/02   | <p><b>19.0 NON DESTRUCTIVE ELECTRIC TEST :</b></p> <p><b>19.1 EDDY CURRENT TESTING :</b></p> <p>Each tube shall be subjected to eddy current test as per ASTM E 426 meeting the requirement of SA 688.</p>  |  |                           |   |          |
| समाप्ति सूची संख्या<br>INVENTORY NO.<br>P-5759  | REV.NO.<br><br>04   |  | निर्माणकर्ता<br>WORKED BY | S.K.BAVEJA  | 29.10.02 |
|   |   |  | जांचकर्ता<br>CHECKED BY   | S.BARAI   | 29.10.02 |





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| सामग्री सूची<br>INVENTORY NO.  |  | 19.2 <b>ULTRASONIC TESTING :</b><br>If specified, all longitudinal welds of tubes shall be examined by ultrasonic testing as per ASTM E-213.   |  |   |  |
| स्वत्वाधिकार एवं गोपनीय<br>COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. |  | 20.0 <b>INSPECTION AT SUPPLIER'S WORKS</b><br>BHEL's representative shall have a free access at all times until work on contract of BHEL is being performed to all parts of the manufacturers works. The supplier shall offer BHEL's representative all reasonable facilities without charge to satisfy the later that the material being furnished is in accordance with this specification.                |  |   |  |
| स्वत्वाधिकार एवं गोपनीय<br>COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. |  | 21.0 <b>QUALITY REQUIREMENT:</b><br>Party shall furnish quality plan on BHEL format along with his quotation. Quality plan shall be approved by BHEL, identifying the check point for witnessing the inter-stage / final inspection testing by BHEL / its customer, third party, for compliance before start of manufacture.   |  |   |  |
| स्वत्वाधिकार एवं गोपनीय<br>COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. |  | 22.0 <b>RETESTS:</b><br>Should any one of the test specimens, first selected by BHEL's representative, fail to pass the mechanical tests, the tube from which the specimen was taken, shall be rejected and further tubes from the same batch shall be selected for testing. Should any of the test specimens from this additional sample fail, the batch represented by them shall be liable for rejection. |  |   |  |
| दिनांक एवं दस्तावेज<br>SIGN & DATE<br>31/10/02   |  | REV.NO.<br>04  |  |   |  |
| सामग्री सूची संख्या<br>INVENTORY NO.<br>P-5759   |  | निर्माणकर्ता<br>WORKED BY<br>S.K.BAVEJA  |  | 29.10.02  |  |
| सामग्री सूची संख्या<br>INVENTORY NO.<br>P-5759   |  | जांचकर्ता<br>CHECKED BY<br>S.BARAI   |  | 29.10.02  |  |







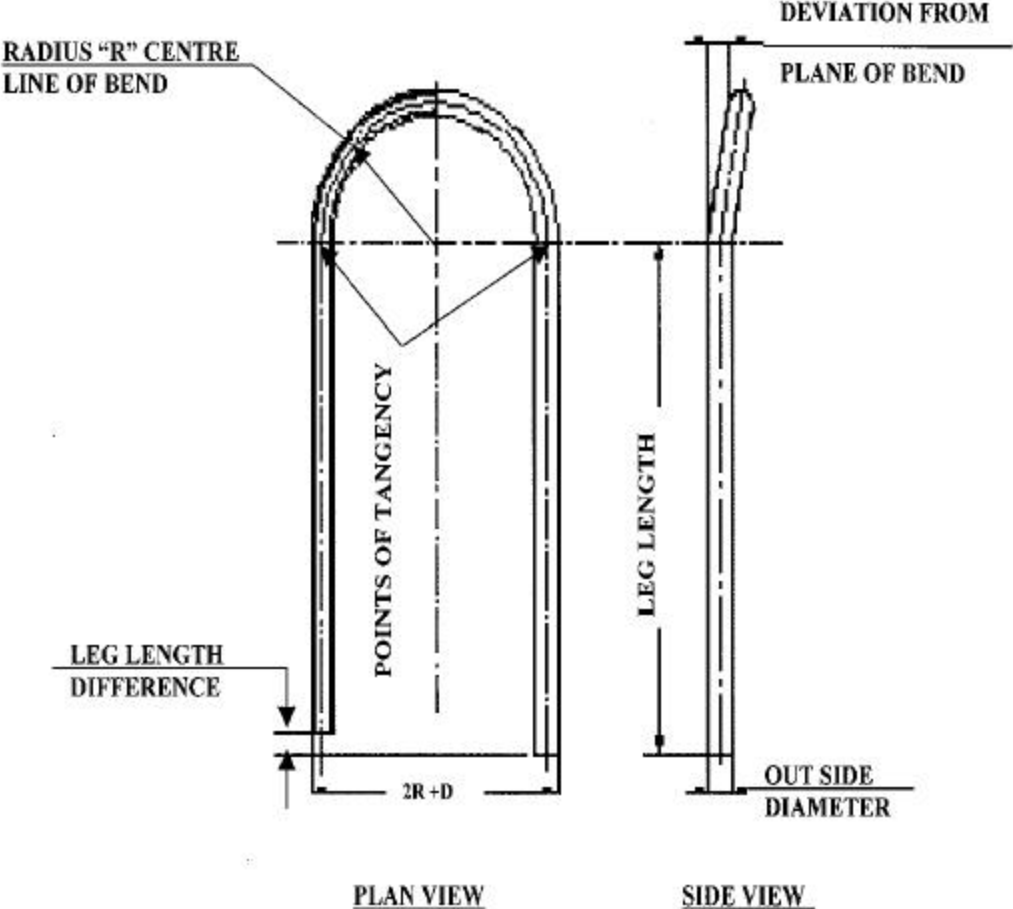


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| SUPERSEDES<br>INVENTORY<br>समाप्ति सूची<br>(विवरण को)   | <p><b>23.0 TEST CERTIFICATE:</b></p> <p>Five copies of the test certificates shall be supplied unless otherwise stated in the order. The test certificate shall bear the following information.</p> <p><b>BHEL REFERENCES:</b></p> <p>HE 57034 : Welded austenitic stainless steel tubes.</p> <p>Project Name:</p> <p>Order NO :</p> <p>Supplier's Reference :</p> <p>Quantity / Weight :</p> <p>Consignment and Identification No. :</p> <p>Tube size :</p>   |                                 |                         |  |  |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. |  |                                 |                         |  |  |
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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE<br>31/10/02   |  |                                 |                         |  |  |
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|   |  |                                 | जांचकर्ता<br>CHECKED BY | S.BARAI                                    |  29.10.02 |

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| SUPERSEDES<br>INVENTORY  |  | <b>26.0 PACKING AND MARKING :</b><br>Shall be as per BHEL's corporate standard AA 0490003 "Preservation Packing and Marking of Heat Exchanger Tubes". The gross weight of the box shall be limited to 3500 Kg. The drawing of the box will be got approved from BHEL. (Only one time approval is required)  |  |   |  |
| स्वामी की सूची संख्या<br>संख्या की   |  | <b>27.0 GUARANTEE:</b><br>Supplier shall undertake the guarantee for free replacement of the tubes against any manufacturing defects for 18 months from the date of dispatch or 12 months from the date of commissioning which ever is later.   |  |   |  |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. |  | <b>NOTE:</b> <ol style="list-style-type: none"> <li>Price of lifting beam shall be indicated separately.</li> <li>Each &amp; every supplier has to fill the enclosed check list ( At sheet no 16,17 and 18) with his offer, otherwise his offer is liable for rejection.</li> <li>Cross referred standards ASTM A370 , ASTM A-688, ASTM A-450, ASTM A-262, ASTM E-426, ASTM E-273.</li> </ol> |  |   |  |
| स्वत्वाधिकार एवं गोपनीय<br>इस प्रलेख में की गई सूचना भारत की इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं अप्रमत्त रूप से किसी की तरह प्रयोग, जो कि कानूनी के विरुद्ध है इतिहासिक हो न किया जाए ।                    |  | निष्कर्ष एवं दिनांक<br>SIGN & DATE<br>31/10/02  |  |   |  |
| स्वामी की सूची संख्या<br>INVENTORY NO.<br><b>P-5759</b>  |  | REV.NO.<br><b>04</b>  | निर्माणकर्ता<br>WORKED BY<br><b>S.K.BAVEJA</b> | जांचकर्ता<br>CHECKED BY<br><b>S.BARAI</b>         | दिनांक<br>DATE<br><b>24.10.02</b><br><b>29.10.02</b> |

|   |  |  |   |            |                      |
|---|--|--|---|------------|----------------------|
| निर्माण एवं प्रमाणित<br>SIGN & DATE   |    | उत्पाद मानक<br><br><b>PRODUCT STANDARD</b> | <b>HE57034</b><br>पृष्ठ 19 का 16<br>Page 16 of 19 |            |                      |
| SUPERSEDES<br>INVENTORY<br><br>समायोजी सूची<br>संशोधन को  | <p align="center"> <u>CHECK LIST FOR U-BENT TUBE</u><br/><br/>         (WELDED STAINLESS STEEL)<br/><br/> <u>(TO BE FILLED BY SUPPLIER)</u> </p> |  |   |            |                      |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this documents is the property of Bharat Heavy Electrical Limited It must not be used directly or indirectly in any way detrimental to the interest of the company | <p>A Name of principal supplier :</p> <p>B Name of Indian Agent :</p>  |  |   |            |                      |
|   | <p>1. Grade of Material as per specification : Yes / No</p>  |  |   |            |                      |
|   | <p>2. Mechanical properties as per specification : Yes / No</p>  |  |   |            |                      |
|   | <p>3. Bright annealing : Yes / No</p>  |  |   |            |                      |
|   | <p>4. Limit of delta-ferrite &lt; 1.0 % : Yes / No</p>   |  |   |            |                      |
|   | <p>5. Maximum residual stress &lt; 4.0 Kg /mm<sup>2</sup> : Yes / No</p>   |  |   |            |                      |
|   | <p>6. Method of measurement of residual stress -- X ray : Yes / No</p>   |  |   |            |                      |
| स्वत्वधिकार एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत भारती इलेक्ट्रिकल्स की संपत्ति है इसका प्रयोग एवं आशयन अन्य के बिना की जाये नहीं, जो कि कंपनी के हित में अधिकारक हो न किया जाए।                            | Diffraction<br>(If any other method, specify the same )  |  |   |            |                      |
| निर्माण एवं प्रमाणित<br>SIGN & DATE<br>31/10/02   | <p>7. Seam height &lt; 0.05 mm : Yes / No</p>  |  |   |            |                      |
| समायोजी सूची संख्या<br>INVENTORY NO.<br>P-5759  | REV.NO.<br>04  |  | निर्माणकर्ता<br>WORKED BY                         | S.K.BAVEJA | S.Baveja<br>29.10.02 |
|   |  |  | जांचकर्ता<br>CHECKED BY                           | S.BARAI    | S.Bara<br>29.10.02   |

|   |  |  |  |  |  |   |  |
|---|--|--|--|--|--|---|--|
| SIGNATURE<br>SIGN & DATE  |  |    |  | उत्पाद मानक<br><b>PRODUCT STANDARD</b> |  | <b>HE57034</b><br>पृष्ठ 19 का 17<br>Page 17 of 19 |  |
| SUPERSEDES<br>INVENTORY   |  | 8. NDT Test Offered<br>i) Hydrostatic Test Yes / No<br>ii) Pneumatic Test Yes / No<br>iii) Helium Leak Test Yes / No<br>iv) Eddy Current Test Yes / No<br>v) Ultrasonic Test Yes / No  |  |  |  |   |  |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bhabha Heavy Electricals Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. |  | 9. TEST:<br>i) Inter-granular Test : Yes / No<br>ii) Residual Chloride Test : Yes / No<br>iii) Micro-structure Test : Yes / No<br>iv) Flattening test : Yes / No<br>v) Flange Test : Yes / No<br>vi) Reverse Bend test : Yes / No<br>vii) Tension Test : Yes / No  |  |  |  |   |  |
| स्वतंत्रताधिकार एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत की प्रौद्योगिकी विकास एवं अनुसंधान संस्थान की गोपनीय है, जो कि कंपनी के हित में प्रसारित नहीं होनी चाहिए।  |  | 10. Chloride Content in water during final rinsing < 5 ppm : Yes / No<br>11. Chloride content in water during Hydraulic / pneumatic Testing < 5ppm. Yes / No<br>12. Tolerance on tube as per specification : Yes / No<br>13. Finish of Tubes : Yes / No<br>i) Outside surface   Ra = 2 micron<br>ii) Inside surface   Rz = 10 micron |  |  |  |   |  |
| SIGNATURE<br>SIGN & DATE<br>3/12/02   |  | REV.NO.<br>04  |  | कार्यकर्ता<br>WORKED BY<br>S.K.BAVEJA  |  | 24.10.02  |  |
| INVENTORY NO.<br>P-5759   |  | जांचकर्ता<br>CHECKED BY<br>S.BARAI   |  | 29.10.02                               |  |   |  |

|  |  |   |                           |  |
|--|--|---|---------------------------|--|
| निर्माण एवं संशोधन<br>SIGN & DATE  |  | उत्पाद मानक<br><br><b>PRODUCT STANDARD</b>  | <b>HE57034</b>            |  |
| SUPERSEDES<br>INVENTORY NO.  | निर्माण एवं संशोधन<br>SIGN & DATE  | 14. Brief write –up on manufacturing process enclosed : Yes / No<br><br>15. Quality plan on BHEL format enclosed : Yes / No<br><br>16. Details of previous experience enclosed Yes / No<br>(Not necessary for those who have already supplied the same material to BHEL, HARDWAR) | पृष्ठ 19 का 18            | Page 18 of 19  |
| <b>COPYRIGHT AND CONFIDENTIAL</b><br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company.  |  | 17. Lifting Beam offered Yes / No<br><br>18. Packing box drawing enclosed : Yes / No<br><br>19. End Guides included (Both end) : Yes / No   |                           |  |
| <b>स्वत्वाधिकार एवं गोपनीय</b><br>इस दस्तावेज में दी गई सूचना भारत भारती इलेक्ट्रिकल्स की संपत्ति है। इसका प्रयोग एवं प्रसारण केवल ही भारत भारती इलेक्ट्रिकल्स की लिमिटेड द्वारा ही किया जा सकता है। अन्यथा इसका प्रयोग करने वाले को भारती भारती इलेक्ट्रिकल्स की लिमिटेड से दंडित किया जाएगा। |  | 20. Deviation taken : Yes / No<br>If yes, list the deviation as below:<br><br>20.1 )<br><br>20.2 )<br><br>20.3 )  |                           |  |
| निर्माण एवं संशोधन<br>SIGN & DATE  | 3/11/02  |   |                           |  |
| निर्माण एवं संशोधन<br>INVENTORY NO.  | REV.NO.<br><br>04  |   | निर्माणकर्ता<br>WORKED BY | S.K.BAVEJA<br> 24.10.02 |
| P-5759   |  |   | जांचकर्ता<br>CHECKED BY   | S.BARAI<br> 28.10.02    |

|   |  |   |                           |   |  |
|---|--|---|---------------------------|---|--|
| 3. EXPIRY SIGN & DATE   |  | उत्पाद मानक<br><b>PRODUCT STANDARD</b>  |                           | <b>HE57034</b><br>पृष्ठ 19 का 19<br>Page 19 of 19 |  |
| SUPERSEDES INVENTORY NO.  | सामग्री सूची संख्या को   |   |                           |   |  |
| <b>COPYRIGHT AND CONFIDENTIAL</b><br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. |  |  |                           |   |  |
| स्वत्वाधिकार एवं गोपनीय<br>इस दस्तावेज में दी गई सूचना भारत भारी इलेक्ट्रिकल्स की सम्पत्ति है। इसका प्रयोग एवं प्रसारण के बिना भारत भारी इलेक्ट्रिकल्स की लिखित अनुमति के बिना नहीं किया जा सकता है।                        |  |   |                           |   |  |
| दस्तावेज का दिनांक<br>SIGN & DATE   | 3/12/02  |   |                           |   |  |
| सामग्री सूची संख्या<br>INVENTORY NO.  | P-5759<br>04   | REV.NO.   | निर्माणकर्ता<br>WORKED BY | S.K.BAVEJA  |  24.10.02 |
|   |  |   | जाँचकर्ता<br>CHECKED BY   | S.BARAI   |  29.10.02 |

## PLANE BEND FOR U-TUBE

(FIG. -1)



## CORPORATE STANDARD

AA 049 00 03

Rev. No. 02

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### PRESERVATION, PACKING AND MARKING OF U-BENT HEAT EXCHANGER TUBES

#### 1.0 SCOPE:

This standard stipulates the requirements preservation, packing and marking of ferrous and non ferrous U-Bent heat exchanger tubes.

#### 2.0 PRESERVATION:

##### 2.1 End Caps/Guides:

All the tubes shall be provided with plastic end caps of conical shape on both ends, in order to avoid ingress of water and other foreign matter.

A typical figure of the plastic cap is shown in the fig 3 for guidance.

##### 2.2 Rust prevention:

All carbon steel tubes shall be applied with suitable temporary rust preventive on the outer surface of the tubes, and required quantity of rust inhibitive powder shall be inserted inside the tubes before end capping.

#### 3.0 PACKING:

##### 3.1 All tubes shall be packed and blocked in such a manner as to prevent damage in ordinary handling and transportation.

The boxes shall be constructed in such a manner that no nails, staples, screws or similar fasteners are required to close and secure the box after the tubes have been placed in the box. The box shall be lined with plastic sheet or vapour barrier materials so as to prevent chloride contamination of the tubes during handling, transportation and storage. The bottom of the case shall be rigid to enable the tubes to maintain straightness. Special lifting tackles, including beams, wherever necessary shall be provided with each case to avoid damage during transit. The U- bent tubes shall be arranged in boxes so that the smaller radius bends may be removed without disturbing larger radius bends. Tubes for each heat exchanger shall be boxed together.

A suitable amount of desiccant such as silica gel shall be placed in each packing box.

##### 3.2 Each package shall be of convenient weight for ease in handling. The weights shall not exceed 2000 Kg (Gross).

##### 3.3 Plastic/ nylon support guides as shown in fig.2 shall be placed in between the tubes in order to prevent rubbing of tube to tube and internal movement.

#### Revisions :

Cl. 18.11.01 of MRC – NFCW+HE

#### APPROVED :

INTERPLANT MATERIAL RATIONALIZATION  
COMMITTEE-MRC (NFCW+HE)

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Year :

HYDERABAD

Corp. R&D

DECEMBER, 1986



3.4 The U-bent tubes of different radii shall be inserted into the slots of the wooden supports which are firmly fixed in the box as shown in Fig.1

3.5 The recommended packing case design and the method of packing is illustrated in fig 1. Any alternate method of packing shall be submitted to BHEL with full particulars and drawings along with the offer for approval.

#### 4.0 MARKING:

4.1 Each tube shall be stenciled with the following information:

- a) BHEL order number:
- b) BHEL Specification No.
- c) Melt/Heat No:
- d) Size of tube:
- e) Supplier 's mark

4.2 A metal label shall be securely attached to each packing case, punched with the following details :

- a) BHEL order number:
- b) BHEL Specification No.
- c) Consignment or Identification No.
- d) Size of the tubes & Total weight
- e) Supplier's Name

4.3 The packing case shall be marked with the following symbols in order to avoid damage during transit:

- a) A mark indicating UP-DOWN position of the case.
- b) A mark indicating that the case shall not be given any impact.
- c) A mark indicating that the case shall be kept free from contact with moisture.
- d) A mark showing the slinging position.

#### 5.0 HANDLING AT PORT, SITE, SHOP, ETC., INCLUDING TRANSPORTATION):

##### 5.1 Procedure:

If the tube length is more than 7000 mm invariably beams are ordered by BHEL, two in numbers which are supplied with first consignment by the vendor.

On receipt of consignment at port, boxes and lifting beams shall be inspected. If boxes are found broken, inspection of tubes shall be carried out. Broken box shall be suitably repaired before sending to site. Boxes shall be inspected before loading on the truck/trailer at supplier's works. Repair shall be carried out if required.

Invariably lifting beam shall be used for handling of boxes.

Boxes shall be placed on the floor on supports ( at least 300 mm above the floor). Distance between supports shall not be more than 500 mm. While handling /stacking, vertical direction as marked on the box shall be followed.

Boxes shall be stacked on each other in such a way that are upright, straight and not projecting outside the lower box. Normally not more than 3 boxes shall be kept on each other.





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### 5.2 Loading of boxes on trailers/trucks:

Preferably trailer shall be of flat floor and its length shall not less than the box. However, in case it is not feasible, following is recommended:

#### Box length max. in metres

20  
15  
10  
8

#### Floor length not less than in metres

18.5  
14  
9.5  
7.6

In case, the floor of trailer/truck is not flat, following procedure shall be adopted:

- Packers of suitable strength shall be placed on the floor such that when boxes are placed, the packer's bottom of the boxes is horizontal.
- Packers shall be placed such that at the driver end, the box projects maximum 300 mm from the support and on the opposite end, it is 300 mm less than end of the floor such that total projection from last support shall not be more than as specified above.
- Boxes shall be placed on each other as specified in clause 5.1. The each vertical row shall be secured tight using ropes /wires and tightened with each other and secured with the trailer floor suitably. The gap between the tightening rope/wire shall not be more than 2 metres.
- Out of two lifting beams, one number shall be sent with first consignment and the second lifting beam with the last consignment.
- Boxes shall be covered with tarpaulin and tightened suitably so as to prevent seepage of water.

### 5.3 Receipt at site:

The boxes shall be again inspected at the site for any breakage, if found shall be reported back to concerned unit.

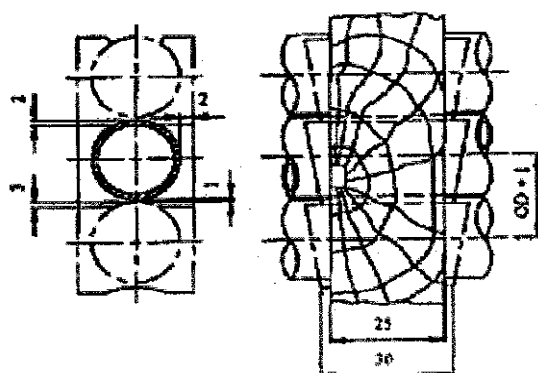
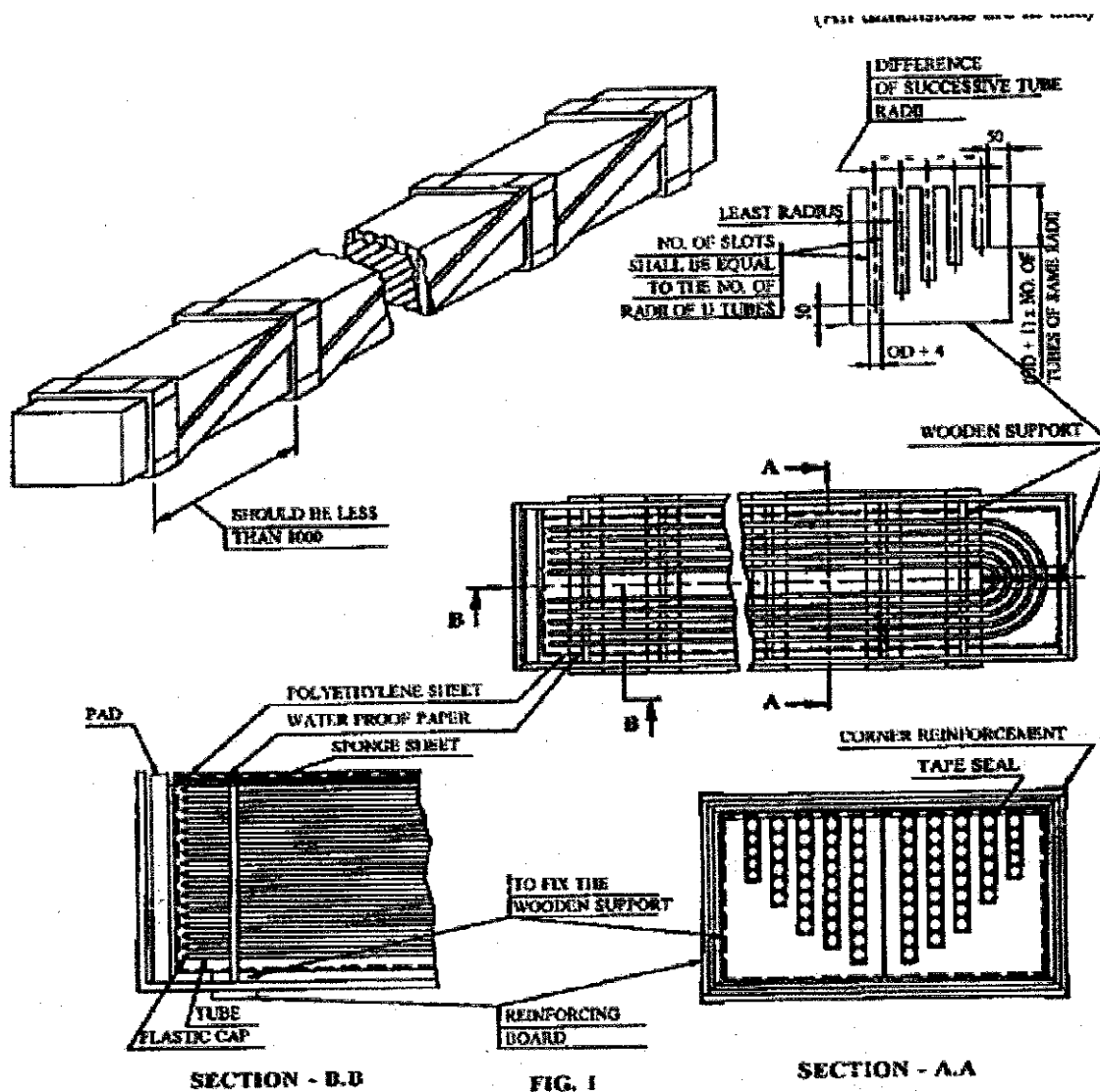
The boxes from trailer/truck shall be lifted using lifting beam only supplied with the first and last consignment and stacked in the store in line with clause 5.1.

The boxes shall be covered with tarpaulin to prevent water seeping in the boxes.

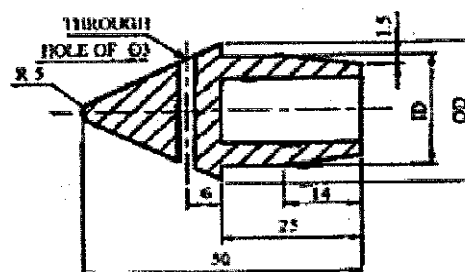
### 6.0 REFERRED STANDARDS (LATEST PUBLICATIONS INCLUDING AMENDMENTS):

NIL

CS-1218



SUPPORT GUIDE DETAIL  
FIG. 2



CAP FOR TUBE END  
FIG. 3