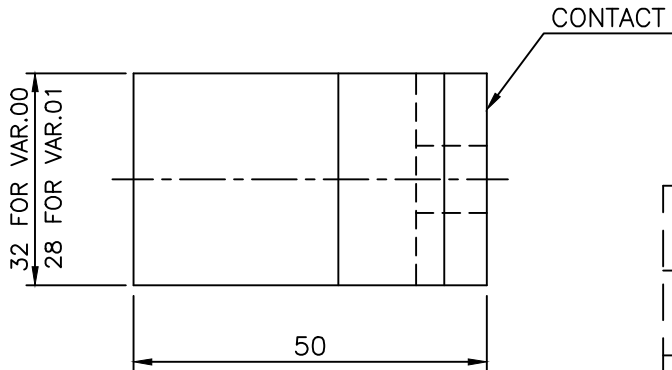
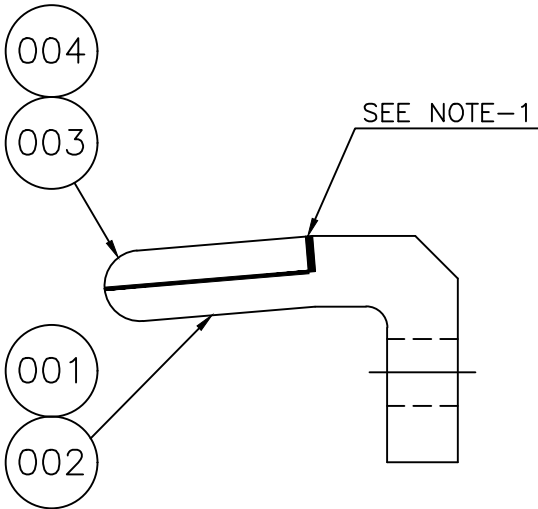


FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm.)

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.

3 580 11 3 0102  
DRAWING NO.



VAR-00 & 01

|         |         |         |         |          |                     |                 |             |         |             |     |      |          |      |      |
|---------|---------|---------|---------|----------|---------------------|-----------------|-------------|---------|-------------|-----|------|----------|------|------|
| 001     | -       |         |         | 004      | COPPER TUNGSTON TIP | 4 580 11 3 0094 | 004         |         |             |     |      |          |      |      |
| -       | 001     |         |         | 003      | COPPER TUNGSTON TIP | 4 580 11 3 0094 | 003         |         |             |     |      |          |      |      |
| 001     | -       |         |         | 002      | CONTACT             | 4 580 11 3 0094 | 002         |         |             |     |      |          |      |      |
| -       | 001     |         |         | 001      | CONTACT             | 4 580 11 3 0094 | 001         |         |             |     |      |          |      |      |
| VAR. 01 | VAR. 00 | REMARKS | VAR NO. | ITEM NO. | DESCRIPTION         | STD.            | DRAWING NO. | IT. NO. | MATL. CODE. | A/C | UNIT | UNIT WT. | QTY. | ISS. |

ISSUED:- R / /

ADDITIONAL INFORMATION

STATUS OF DRAWING M

DISTRIBUTION OF PRINTS  
OFFICE COPY - 1  
SWM - 4  
TCX (SWM) - 1

|                                                   |                                         |                 |                            |                                          |                                 |                            |
|---------------------------------------------------|-----------------------------------------|-----------------|----------------------------|------------------------------------------|---------------------------------|----------------------------|
| उत्पाद का प्रकार या ग्राहक/परियोजना का नाम        |                                         | 25 KV AC EMU    |                            |                                          |                                 |                            |
| TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT       |                                         | INDIAN RAILWAYS |                            |                                          |                                 |                            |
| बी.एच.ई.एल. भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल |                                         | बनाया DRN.      | नाम/NAME                   | हस्ता/SIGN.                              | दिनांक/DATE                     | वेरि की संख्या NO. OF VAR. |
| BHEL BHARAT HEAVY ELECTRICALS LTD. BHOPAL         |                                         | जोचा CKD.       | R.C.B.                     | -Sd.-                                    | 15.01.08                        | 01                         |
|                                                   |                                         | अनुमोदित APPD.  | R.K.S.                     | -Sd.-                                    | 15.01.08                        |                            |
| विभाग DEPT. CEE                                   | अन. टोल. नाप की श्रेणी UNTOL. DIMS. GR. | अनुपात SCALE    | भार कि.ग्रा. WEIGHT (K.G.) | असे. ड्राइंग क्र. संदर्भ REF. TO ASSY.   | मद क्र. ITEM NO.                | मद. संख्या NO. OF ITEM     |
| कोड CODE. 407                                     | REF CG 06503                            | 1:1             | -                          | VAR.00-05801130005<br>VAR.01-05801230004 | 016<br>021                      | 004                        |
| शीर्षक/ TITLE                                     |                                         |                 |                            | ड्राइंग क्र./DRAWING NO.                 | पुन./REV.                       |                            |
| CONTACT ASSEMBLY                                  |                                         |                 |                            | 3 580 11 3 0102                          | 02                              |                            |
|                                                   |                                         |                 |                            | प्रष्ठ क्र./ SHT.NO 01                   | प्रष्ठों की संख्या/ NO. OF SHT. | 01                         |

G364

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

|                                                                                                                                                                                         |                                                                                                                     |              |                           |      |      |                                                          |                        |        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------|---------------------------|------|------|----------------------------------------------------------|------------------------|--------|
| 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. | REV. 01                                                                                                             | DATE 16.4.18 | ALTERED T.R.D. <i>RD</i>  | REV. | DATE | ALTERED                                                  | ADDITIONAL INFORMATION | AC EMU |
|                                                                                                                                                                                         |                                                                                                                     |              | CHECKED D.D. <i>RD</i>    |      |      | CHECKED                                                  |                        |        |
|                                                                                                                                                                                         |                                                                                                                     |              | APPROVED R.K.S. <i>RD</i> |      |      | APPROVED                                                 |                        |        |
|                                                                                                                                                                                         | DRAWING REDRAWN & COMPUTERISED. DIMS. 7X45°, 13 & 33 WERE 6X45°, 15 & 32 RESP'Y. ANGLE POSITION CHANGED FOR 94.75°. |              |                           |      |      |                                                          | STATUS OF DRAWING      | M      |
|                                                                                                                                                                                         |                                                                                                                     |              |                           |      |      | DISTRIBUTION 0/C - 1, SWM - 4<br>OF PRINTS TCX (SWM) - 1 |                        |        |

003
004

SEE NOTE 1

001  
002

**NOTE :-**

- CONTACT TO BE MADE BY MACHINING FROM EXTRUDED COPPER SECTION OR FROM COPPER TO PR. SPEC. AA 12023.
- ITEM-003 & 004 ARE MADE OF COMPOSITION OF TUNGSTEN AND COPPER IN 70/30%.

|         |          |                     |     |              |     |               |
|---------|----------|---------------------|-----|--------------|-----|---------------|
|         | 004      | COPPER TUNGSTON TIP |     |              | MM  |               |
|         | 003      | COPPER TUNGSTON TIP |     |              | MM  |               |
|         | 002      | CONTACT             |     | AA 12023     | MM  |               |
|         | 001      | CONTACT             |     | AA 12023     | MM  |               |
| REMARKS | ITEM NO. | DESCRIPTION         | STD | MATL. CODE   | A/C | UNIT          |
|         |          |                     |     | MATL. SPECN. |     | UNIT WT. QTY. |

INVENTORY NO. 4 580 11 30092

REF. DRG. NO.

SIGN. & DATE

कम्प्यूटर ड्राईंग

पडल कमीक 45801130094

ISSUED:-

| नाम / NAME | हस्ता / SIGN | दि./DATE | वेरि की संख्या NO. OF VAR. |
|------------|--------------|----------|----------------------------|
| DRN. RCB   | -Sd/-        | 14.01.08 |                            |
| CKD. RKS   | -Sd/-        | 14.01.08 |                            |
| APPD. AG   | -Sd/-        | 14.01.08 |                            |

|                |                                        |                  |                           |                                        |                            |                       |
|----------------|----------------------------------------|------------------|---------------------------|----------------------------------------|----------------------------|-----------------------|
| विभाग DEPT     | अन.टोल.नाप की त्रेणी UN.TOL. DIMS. GR. | अनुपात SCALE 1:1 | भार (कि.ग्रा.) WEIGHT(KG) | उसे ड्राईंग का संदर्भ REF.TD ASSY.DRG. | मद क्र. ITEM NO.           | मद संख्या NO. OF ITEM |
| कोड 407 CODE   | REF. CG 06503                          |                  |                           | IT.S 001-004-35801130102               | 001-004                    | 004                   |
| शीर्षक/TITLE   |                                        |                  |                           | ड्राईंग क्र. /DRAWING NO.              |                            | पुन./REV              |
| <b>CONTACT</b> |                                        |                  |                           | 4 580 11 3 0094                        |                            | 01                    |
|                |                                        |                  |                           | शीट क्र /SHT.NO 01                     | शीटों की सं./NO.OF.SHT. 01 |                       |



## CORPORATE PURCHASING SPECIFICATION

AA 120 23

Rev. No. 08

PAGE 1 OF 5

### COPPER RODS AND SECTIONS - HARD

#### 1.0 GENERAL:

This specification governs the quality requirements of copper rods/bars and sections.

#### 2.0 APPLICATION:

Used for general electrical purposes in Transformers, switch gears, Bus - bars, HT/MT caps and control equipment.

#### 3.0 CONDITION OF DELIVERY:

The copper rods shall be supplied in hard condition in straight lengths. Rectangular rods shall be supplied with radiused edges to clause 5.3.

#### 4.0 COMPLIANCE WITH NATIONAL STANDARDS:

The copper rods and bars shall comply with the requirements of the following national standard and also meet the requirements of this specification.

IS: 613- 2000 : Copper Rods and Bars For  
Condition : Hard Electrical purposes - specification.

#### 5.0 DIMENSIONS AND TOLERANCES:

##### 5.1 Sizes.

Copper rods and sections shall be supplied to the dimensions specified in BHEL order / drawing.

##### 5.2 Tolerances:

5.2.1 The tolerances for round, square, rectangular and hexagonal rods / bars shall be as given below :  
[Table - 2 of IS: 613]

##### 5.2.2 Sections:

Shall be as per BHEL drawing accompanying the order.

#### Revisions :

CI: 24.1 of MOM of MRC-NFCW+HE

#### APPROVED :

INTERPLANT MATERIAL RATIONALISATION  
COMMITTEE-MRC (NFCW+HE)

Rev. No.08

Amd.No.

Reaffirmed

Prepared

Issued

Dt. of 1st Issue

Dt:06.06.2012

Dt :

Year :

BHOPAL

Corp. R&D

Nov, 1978

|             |  |                                       |  |                                                                                     |
|-------------|--|---------------------------------------|--|-------------------------------------------------------------------------------------|
| AA 120 23   |  | CORPORATE PURCHASING<br>SPECIFICATION |  |  |
| Rev. No. 08 |  |                                       |  |                                                                                     |
| PAGE 2 OF 5 |  |                                       |  |                                                                                     |

5.2.3 Length - Rod/Sections:

Tolerance on length shall be as follows:

| Length, mm |              | Tolerances, ± mm |
|------------|--------------|------------------|
| Over       | Upto & incl. |                  |
| -          | 150          | 1.2              |
| 150        | 1200         | 1.5              |
| 1200       | 2400         | 2.5              |
| 2400       | -            | 5.0              |

5.2.4 Straightness:

The straightness and/or edgewise curvature (edge bow ) shall not exceed 3 mm for every 1000 mm length.

5.2.5 Radius on Edges - Rectangular & Squares:

| Thickness, mm |                 | Edges Radius, mm                          | Tolerance in Radius ± mm |
|---------------|-----------------|-------------------------------------------|--------------------------|
| Over          | Upto and incl . |                                           |                          |
| 6             | 25              | 2.5                                       | 0.25                     |
| 25            | 50              | 3.2                                       | 0.25                     |
| 50            | -               | as agreed to between BHEL & manufacturer. |                          |

6.0 MANUFACTURE:

The copper rods shall be manufactured from copper of ETP grade conforming to IS: 191. The conductor shall be manufactured from ETP grade copper conforming to BHEL specification AA 120 24:: Electrolytic Tough Pitch Copper Wire/Bars/Ingots/Continuously cast wire rods.

Note: It is preferable to manufacture conductor from continuously cast copper rods provided all other parameters and conditions remain same."

7.0 FREEDOM FROM DEFECTS:

The copper rods shall be clean, bright, smooth and free from fins, spills, scaling, blisters, cracks and other defects.

8.0 CHEMICAL COMPOSITION:

The analysis of copper when analyzed in accordance with IS 440 or by any other Conventional/ Instrumental method shall be as follows:

| Element                                           | Percent, min. | Percent, max. |
|---------------------------------------------------|---------------|---------------|
| Copper and Silver                                 | 99.90         | -             |
| *Bismuth                                          | -             | 0.001         |
| *Lead                                             | -             | 0.005         |
| *Total of all impurities excl. silver and oxygen. | -             | 0.030         |



## CORPORATE PURCHASING SPECIFICATION

AA 120 23

Rev. No. 08

PAGE 3 OF 5

- These elements need not be determined when the material supplied conforms with the mechanical and electrical properties specified in this specification. However, the supplier shall ensure that the composition of the material lies within the limits specified above.

### 9.0 TEST SAMPLES:

9.1 Tests shall be conducted as follows:

Rods and bars : Mechanical and Electrical.  
Sections : Hardness and Electrical.

9.2 One sample per size per melt per consignment of 3 tonnes or part thereof shall be taken for chemical, mechanical and electrical tests.  
The sample shall be cut off cold and shall receive no further treatment before being tested .

### 10.0 MECHANICAL PROPERTIES:

#### 10.1 Tensile Strength:

The test samples, when tested in accordance with IS: 1608 shall show the following properties and hardness as per IS:1501.

##### 10.1.1 Round: TABLE FOR HD

| Dia., Width, Across<br>flats or Thickness, mm |              | Tensile strength, N/mm <sup>2</sup> ,min. |                      |                  | Elongation on 5.65√So<br>of gauge length, % min. |                      |                  | Hardness<br>for all shapes<br>HV, min. |
|-----------------------------------------------|--------------|-------------------------------------------|----------------------|------------------|--------------------------------------------------|----------------------|------------------|----------------------------------------|
| Over                                          | Upto & incl. | Round                                     | Square/<br>Hexagonal | Rect-<br>angular | Round                                            | Square/<br>Hexagonal | Rect-<br>angular |                                        |
| 6.0                                           | 10.0         | 330                                       | -                    | -                | -                                                | -                    | -                | 90                                     |
| 10.0                                          | 12.0         | 320                                       | 310                  | 270              | 6                                                | 6                    | 8                |                                        |
| 12.0                                          | 25.0         | 290                                       | 280                  | 260              | 8                                                | 8                    | 8                |                                        |
| 25.0                                          | 90.0         | 260                                       | 250                  | 250              | 12                                               | 12                   | 10               |                                        |
| > 90.0                                        |              | As agreed between BHEL and manufacturer.  |                      |                  |                                                  |                      |                  |                                        |

##### 10.1.2 Rods /Bars other than rectangular:

For material over 30 mm dia, thickness or width a cross flats, the test piece shall be turned with its centre 14mm from the surface of the material for material of smaller dia or width, which may not be tested in the condition as manufacture of the test pieces shall be turned from the centre of the material.

##### 10.1.3 Rectangular Bars/Rods:

The test piece shall be taken from the centre of the rod/bar.

#### 10.2 Bend Test:

The material shall be tested for bend test in accordance with IS:1599, if specified in BHEL order.

### 11.0 ELECTRICAL RESISTIVITY (As Received):

When measured in accordance with IS: 3635, the electrical resistivity of the sample in as received condition at 20<sup>0</sup> C shall not be greater than 0.0177 ohm. mm<sup>2</sup> / metre, which is equivalent to an electrical conductivity of 97% minimum of IACS standard. (Refer Appendix B of IS: 613 for temperature correction factor.) Alternatively, the method of measurement employing eddy current probes as per ASTM E 1004 is also acceptable.

## CORPORATE PURCHASING SPECIFICATION



### 12.0 CHECK LIST:

The supplier shall fill up the enclosed checklist as per Annexure-A and submit the same alongwith each batch.

### 13.0 INSPECTION AT SUPPLIER'S WORKS:

Whenever specified, tests and inspection are to be conducted in the presence of BHEL'S representative .

The supplier shall offer BHEL's representative all reasonable facilities, without charge to satisfy the latter that the material is being furnished in accordance with this specification. The supplier shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilities are not available at his carrying out the prescribed tests elsewhere. The supplier shall notify BHEL in advance about the readiness of the material for inspection and testing.

BHEL reserves the right to test the material at BHEL'S works and the final acceptance of the material shall be based on these test results.

### 14.0 TEST CERTIFICATES:

Unless otherwise stated, three copies of test certificates shall be supplied along with each consignment.

In addition, the supplier shall ensure to send one copy of test certificates along with the despatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

AA 12023 (Rev. No. 08) : Copper Rods and sections - Hard

BHEL Order No.

Manufacturer 's / Supplier 's Name

Lot /Identification / Batch /Melt No.

Sizes and Quantity Supplied

Results of dimensional inspection, Chemical analysis,

Mechanical and electrical tests as per this specification.

### 15.0 PACKING AND MARKING:

The material shall be suitably packed to prevent damage during transit.

Each package shall be legibly marked or labeled with the following information.

AA 12023 : Copper Rod and sections - Hard

BHEL Order No

Manufacturer's/ supplier's Name

Lot/Identification/ Batch /Melt No.

Size and Quantity supplied.

### 16.0 REFERRED STANDARDS( LATEST PUBLICATION INCLUDING AMENDMENTS):

- |            |            |             |             |                |
|------------|------------|-------------|-------------|----------------|
| 1) IS:191  | 2) IS:440  | 3) IS:613   | 4) IS:1501  |                |
| 5) IS:1599 | 6) IS:1608 | 7) IS: 2826 | 8) IS: 3635 | 9) ASTM E 1004 |



## CORPORATE PURCHASING SPECIFICATION

AA 120 23

Rev. No. 08

PAGE 5 OF 5

### ANNEXURE - A (Clause 12.0)

#### CHECK LIST FOR AA 120 23: COPPER RODS AND SECTIONS - HARD (To be filled by Supplier)

- A. Name of Principal Supplier :
- B. Name of Indian Agent :
1. Grade of material as per specification : Yes/No
2. Tolerance on diameter/ Width/thickness/ length and flatness as per specification and drawing : Yes/No
3. Chemical composition as per specification : Yes/No
4. Mechanical properties as per specification : Yes/No
5. Electrical Resistivity : Yes/No
6. Tests : (1) Bend
7. Details of previous experience enclosed : Yes/No.  
(For New suppliers only)
- C. Deviations taken (Please specify clearly, if any) : Yes/No.  
1  
2  
3

Date:

Signature &

Place:

Seal of Supplier

**Pre-Qualification requirements**  
**for “Indented Items”**

| <b>S. No</b> | <b>Description of requirement</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Document to be attached</b>                                                   |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 1            | Quoted Items SL NO.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Mention SI No.                                                                   |
| 2            | Bidder should submit a self-declaration stating that, “Offered item is same as per enquiry Specification and there is no deviation”.                                                                                                                                                                                                                                                                                                                                                                                                                       | Self-declaration on letterhead of firm                                           |
| 3            | In case Bidder is not be OEM but its Reseller then bidder to submit valid authorisation certificate from OEM with the bid.                                                                                                                                                                                                                                                                                                                                                                                                                                 | Valid authorisation letter from OEM.                                             |
| 4            | Bidder should have supplied minimum 10 nos in any one of last 15 years (To be reckoned from the Bid opening date) same or similar either of indented items (which have involved manufacturing activities such as copper bending, machining, brazing etc.) for use in Railway Traction products to BHEL or any Central / State Govt Organization /Private/ PSU or any other establishment of Indian Railways or/ through Rail System designer/manufacturer/Channel Partner/Supplier Bidder to furnish Purchase Order copy(s)/Invoice(s) as proof of supply. | PO Copy/Invoice Copy for other than BHEL BHOPAL PO<br>(PO no for BHEL Bhopal PO) |

**Terms Other than PQR to be compiled during Bidding:**

| <b>Terms</b>                                                        | <b>Complied/Not Complied</b> |
|---------------------------------------------------------------------|------------------------------|
| Quoted SL NO.                                                       |                              |
| OEM Declaration/Authorization Certificate to be submitted by vendor |                              |
| Delivery accepted as per Tender                                     |                              |
| Mobile no of concerned Person                                       |                              |
| Email ID                                                            |                              |

Note: Bidders providing above documents and not meeting above criteria essential for Offer Consideration.

| <b>ITEM SL NO</b> | <b>Quoted/ Not-Quoted</b> |
|-------------------|---------------------------|
| 1                 |                           |
| 2                 |                           |

**NO DEVIATION CERTIFICATE**

**Reference:** Bid No. \_\_\_\_\_ Dated: \_\_\_\_\_

**Subject:** Self-Declaration for No Deviation

This is to certify that the items/services offered by us against the above-referred enquiry are **fully compliant** with the specifications, terms, and conditions mentioned in the bid document.

We hereby confirm that **there are no deviations** from the stipulated specifications, commercial terms, conditions, and other requirements of the enquiry.

For \_\_\_\_\_  
(Authorized Signatory)

Date: \_\_\_\_\_

Seal:

**OEM SELF-DECLARATION (FOR OEM)**

Date: \_\_\_\_\_

Subject: **OEM Self-Declaration**

Ref: Bid No. \_\_\_\_\_

We certify that:

1. The bidder **M/s** \_\_\_\_\_ is the OEM\*\* itself.
2. The product(s) offered are **new, genuine, and comply** with all specifications mentioned in the tender.
3. We shall provide full **warranty support, technical assistance, and spare parts** availability as required.

For **(Name of OEM)**

\_\_\_\_\_

**Authorized Signatory**

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

Seal:

OEM address:

**\*\* OEM refers to (Original Equipment Manufacturer)**

**B. OEM AUTHORIZATION CERTIFICATE (FOR BIDDER AS DEALER)**

Date: \_\_\_\_\_

Subject: **OEM Authorization Certificate**

Ref: Bid No. \_\_\_\_\_

We, **(Name of Original Equipment Manufacturer – OEM)**, hereby authorize:

**M/s** \_\_\_\_\_  
(Address: \_\_\_\_\_)

We confirm that:

1. Bidder is **authorized partner / dealer / distributor / bidder** for participating in the above-mentioned tender
2. The bidder is authorized to **quote, supply, install (if any), and support** our products.
3. The products offered will be **genuine, brand-new, and manufactured by us (OEM)**.
4. We will provide full **warranty support, technical support, and spare parts** for the supplied equipment throughout the warranty/AMC period.

For **(Name of OEM)**

---

**Authorized Signatory**

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

Seal:

**\*\* OEM refers to (Original Equipment Manufacturer)**