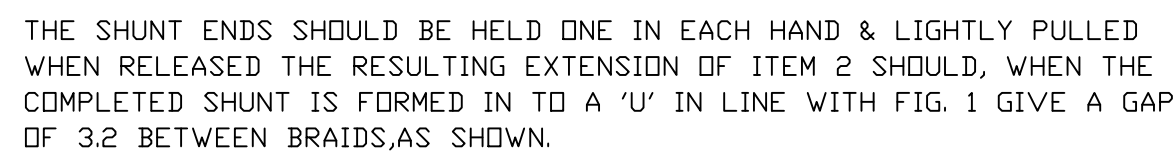


|               |              |                  |
|---------------|--------------|------------------|
| INVENTORY NO. | SIGN. & DATE | E8600338 (COL-A) |
|               |              | REF. DRG. NO.    |

8



| STYLE LIST     |              |                        |              |
|----------------|--------------|------------------------|--------------|
| STYLE CODE NO. | IT. INCLUDED | DESCRIPTION OR REMARKS | RECORDED     |
|                |              |                        | SING. DATE   |
| BP 9048500664  | VAR.00       | ASSEMBLY OF SHUNT      | Sd/- 30.11.9 |

1. AFTER PRESSING SILVER PLATING THICKNESS ON SHUNT ENDS TO BE 0.004 <sup>(CR)</sup> MINIMUM.
2. PLATING THICKNESS IS CRITICAL TO QUALITY AND TO BE CHECKED AS FOLLOWING :
  - A) 5% RANDOMLY FOR THE SUPPLY LOT OF 1000 NUMBER OR BELOW.
  - B) 2% RANDOMLY FOR THE SUPPLY LOT OF MORE THAN 1000 NUMBER.
3. WEIGHT DETAILS:
  - A) WEIGHT OF SILVER=0.003KG.
  - B) WEIGHT OF COPPER=0.2477KG.
  - C) TOTAL WEIGHT=0.2507KG.

|                  |         |            |                  |                         |                |             |                  |            |      |          |      |      |
|------------------|---------|------------|------------------|-------------------------|----------------|-------------|------------------|------------|------|----------|------|------|
| 001              |         |            | 003              | SHUNT<br>FLEX CPR BRAID | 4 580 11 30027 | 001         |                  |            | MM   | 229      |      |      |
| 001              |         |            | 002              | SHUNT<br>FLEX CPR BRAID | 4 580 11 30027 | 001         |                  |            | MM   | 203      |      |      |
| 002              |         |            | 001              | SHUNT END               | 3 580 11 30040 | 001         |                  |            |      |          |      |      |
| VAR00            | REMARKS | VAR<br>NO. | ITEM<br>NO.      | DESCRIPTION             | STD            | DRAWING NO. | IT.ND.           | MATL. CODE | UNIT | UNIT WT. | QTY. | TIME |
| 28 → CARD TYPE-3 |         |            | 28 → CARD TYPE-1 |                         |                |             | 28 → CARD TYPE-2 |            |      |          |      |      |

|   |          |                                |   |                      |  |
|---|----------|--------------------------------|---|----------------------|--|
| ADDITIONAL INFORMATION  |          |                                | A.C. EMU<br>INDIAN RAILWAYS   |                      |  |
| STATUS OF DRAWING   |          |                                | उत्पाद का प्रकार या<br>ग्राहक/परियोजना का नाम<br>TYPE OF PRODUCT OR<br>NAME OF CUSTOMER/PROJECT |                      |  |
| DISTRIBUTION OF PRINTS<br>OFFICE COPY- 1,<br>SWM -4<br>TCX(SWM) 1 |          |                                | भारत हेवी इलेक्ट्रिकल्स लिमिटेड<br>भोपाल<br>BHARAT HEAVY ELECTRICALS LTD.<br>BHOPAL             |                      |  |
|   |          |                                | बनाया<br>DRN.<br>जांचा<br>CKD.<br>स्वीकृत<br>APPD.  |                      |  |
|   |          |                                | नाम /NAME<br>V.J.<br>MANI<br>V.P.A.   |                      |  |
|   |          |                                | हस्ता /SIGN.<br>-SD-<br>-SD-<br>-SD-  |                      |  |
|   |          |                                | दि./DATE<br>3.10.81<br>2.1.82<br>11.3.83  |                      |  |
|   |          |                                | वेरि की<br>संख्या<br>NO. OF<br>VAR.<br>00<br>00<br>00   |                      |  |
| REV.  | DATE     | ALTERED<br>CHECKED<br>APPROVED | KLJ<br>KSA<br>MSQ   | -SD-<br>-SD-<br>-SD- |  |
| 04  | 03.03.97 |                                |   |                      |  |
| ZONE  |          |                                | डिप्टा.<br>CEE<br>कोड<br>CODE 407   |                      |  |
| NOTE-1 ADDED.   |          |                                | अनु. टाबल नाम की श्रेणी<br>UNTOL. DIMS. GR.<br>REF.C.G.06503                                    |                      |  |
|   |          |                                | अनुपात<br>SCALE<br>1:1  |                      |  |
|   |          |                                | भार कि या<br>WEIGHT (K.G.)<br>0.160   |                      |  |
|   |          |                                | असे. ड्राइंग का संदर्भ<br>REF. TO ASSY.<br>2 580 11 30024                                       |                      |  |
|   |          |                                | मद संख्या<br>ITEM NO.<br>004  |                      |  |
|   |          |                                | मद संख्या<br>NO. OF<br>ITEM<br>003  |                      |  |
|   |          |                                | शीर्षक/TITLE<br>ASSEMBLY OF SHUNT   |                      |  |
|   |          |                                | ड्राइंग क्र. /DRAWING NO.<br>2 580 11 30026   |                      |  |
|   |          |                                | पुन. /<br>REV.<br>07  |                      |  |
|   |          |                                | प्रश्न क्र./SHT NO. 01<br>प्रश्नों की संख्या /<br>No OF SHT. 01                                 |                      |  |

FIRST ANGLE PROJECTION

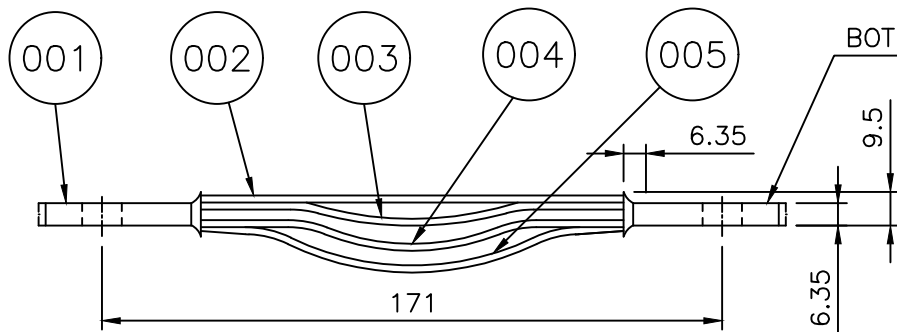
(ALL DIMENSIONS ARE IN mm.)

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.

D 8638475, COL.-D  
REF. DRG. NO.

SIGN. & DATE  
INVENTORY No.

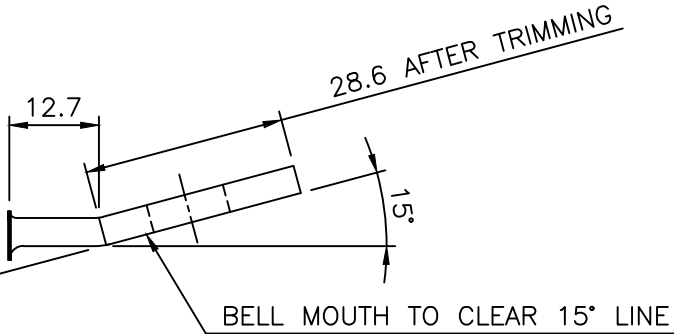
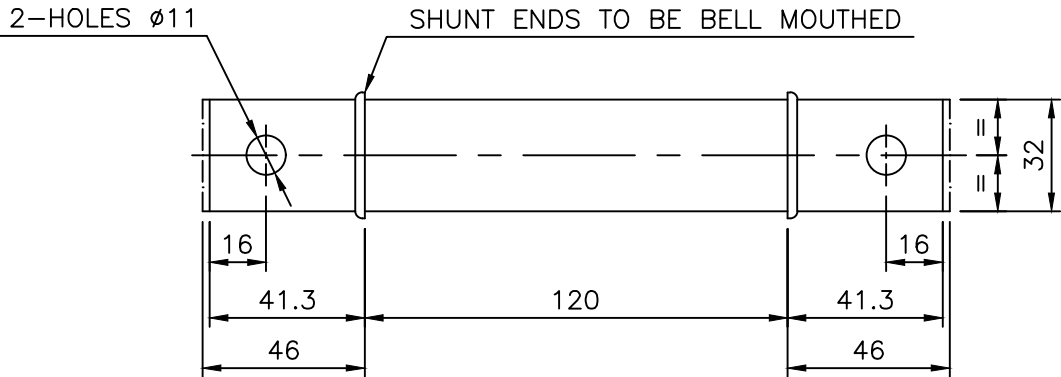
3 580 11 3 0047  
ड्राइंग क्र./DRAWING NO.



ALL DIMENSIONS ON THIS VIEW  
FOR D.O. REF. ONLY

NOTE :-

1. STYLE CODE NO. FOR VAR.00, BP 9048548756.
2. AFTER PRESSING SILVER PLATING THICKNESS ON FERRULES TO BE 0.004 <sup>(CR)</sup> MINIMUM.
3. PLATING THICKNESS IS CRITICAL TO QUALITY AND TO BE CHECKED AS FOLLOWING :  
A) 5% RANDOMLY FOR THE SUPPLY LOT OF 1000 NUMBER OR BELOW.  
B) 2% RANDOMLY FOR THE SUPPLY LOT OF MORE THAN 1000 NUMBER.
4. WEIGHT DETAILS:  
A) WEIGHT OF SILVER=0.0022KG (VAR.00), 0.0022KG (VAR.01).  
B) WEIGHT OF COPPER=0.4363KG (VAR.00), 0.5510KG (VAR.01).  
C) TOTAL WEIGHT=0.4385KG (VAR.00), 0.5532KG (VAR.01).



|        |         |         |         |          |  |      |                 |         |             |        |      |          |     |
|--------|---------|---------|---------|----------|--|------|-----------------|---------|-------------|--------|------|----------|-----|
| 001    | —       |         |         | 005      | BRAID ST. 854603<br>FLEX. COPPER BRAID |      | 3 581 50 3 0009 | 001     |             |        | MM   |          |     |
|        |         |         |         |          |  |      |                 |         |             |        |      | 272      |     |
| 001    | 001     |         |         | 004      | BRAID ST. 854603<br>FLEX. COPPER BRAID |      | 3 581 50 3 0009 | 001     |             |        | MM   |          |     |
|        |         |         |         |          |  |      |                 |         |             |        |      | 251      |     |
| 001    | 001     |         |         | 003      | BRAID ST. 854603<br>FLEX. COPPER BRAID |      | 3 581 50 3 0009 | 001     |             |        | MM   |          |     |
|        |         |         |         |          |  |      |                 |         |             |        |      | 232      |     |
| 001    | 001     |         |         | 002      | BRAID ST. 854603<br>FLEX. COPPER BRAID |      | 3 581 50 3 0009 | 001     |             |        | MM   |          |     |
|        |         |         |         |          |  |      |                 |         |             |        |      | 213      |     |
| 002    | 002     |         |         | 001      | FERRULE                                |      | 4 580 11 3 0028 | 001     |             |        |      |          |     |
|        |         |         |         |          |  |      |                 |         |             |        |      |          |     |
| VAR.01 | VAR. 00 | REMARKS | VAR NO. | ITEM NO. | DESCRIPTION                            | STD. | DRAWING NO.     | IT. NO. | MATL. CODE. | A<br>C | UNIT | UNIT WT. | GS. |
|        |         |         |         |          |  |      |                 | VAR     | MATL. SPCN. |        |      | QTY.     |     |

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  
AC EMU  
INDIAN RAILWAYS

TYPE OF PRODUCT OR  
NAME OF CUSTOMER/PROJECT



भारत हेवी इलेक्ट्रिकल्स लिमिटेड  
भोपाल  
BHARAT HEAVY ELECTRICALS LTD.  
BHOPAL

|                   |          |             |             |                    |
|-------------------|----------|-------------|-------------|--------------------|
| बनाया<br>DRN.     | नाम/NAME | हस्ता/SIGN. | दिनांक/DATE | वेरि. की<br>संख्या |
| जाँचा<br>CKD.     | L.M.O.   | Sd/-        | 30.09.81    | NO. OF<br>VAR.     |
| अनुमोदित<br>APPD. | MANI     | Sd/-        | 22.01.82    | 01                 |
|                   | V.P.A.   | Sd/-        | 10.03.83    |                    |

|               |          |   |  |          |  |   |          |   |                    |  |                 |                               |   |                     |                                       |
|---------------|----------|---|--|----------|--|---|----------|---|--------------------|--|-----------------|-------------------------------|---|---------------------|---------------------------------------|
| REV           | DATE     | ALTERED MDS<br>CHECKED MM<br>APPROVED BSM | REV  | DATE     | ALTERED BC<br>CHECKED VJ<br>APPROVED RKS | REV   | DATE     | ALTERED RCB<br>CHECKED RKS<br>APPROVED AG | विभाग<br>DEPT. CEE | अन. टोल. नाप की श्रेणी<br>UNTOL. DIMS. GR. | अनुपात<br>SCALE | भार कि.ग्रा.<br>WEIGHT (K.G.) | असे. ड्राइंग क्र. संदर्भ<br>REF. TO ASSY. | मद क्र.<br>ITEM NO. | मद. संख्या<br>NO. OF<br>ITEM          |
| 05            | 21.05.26 |   | 04   | 18.03.14 |  | 03  | 08.11.05 |   | कोड<br>CODE. 407   | REF CG 06503<br>CG 06503                   | 1:2             | -                             | VAR.00- 25801130033                       | 001                 | 005                                   |
| NOTE 4 ADDED. |          |   | NOTE 3 ADDED FOR CTQ ON<br>PLATING THICKNESS.<br>IN NOTE PLATING THICKNESS<br>WAS 0.008 MIN. |          |  | VAR.01 ADDED.<br>DRG. COMPUTERISED & REDRAWN. |          |   | शीर्षक / TITLE     |  |                 | ड्राइंग क्र./DRAWING NO.      |   |                     | पुन. /REV.                            |
| DCA NO.-29460 |          |   |  |          |  |   |          |   | ASSEMBLY OF SHUNT  |  |                 | 3 580 11 3 0047               |   |                     | 05                                    |
|               |          |   |  |          |  |   |          |   |                    |  |                 | प्रष्ठ क्र./SHT.NO 01         |   |                     | प्रष्ठों की संख्या/<br>NO. OF SHT. 01 |

ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm.

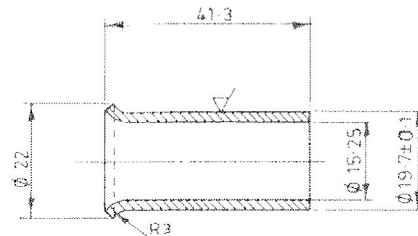
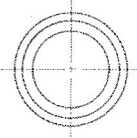
DRG. NO. 3 580 11 089 3 0000

### STYLE LIST

| STYLE CODE NO. | ITEM INCLUDED | DESCRIPTION OR REMARKS | RECORDED                  |
|----------------|---------------|------------------------|---------------------------|
| BP 9048575605  | 001           | SHUNT END              | SIG. DATE<br>John 7-10-81 |

### TOOL LIST

| ITEM | TOOL    | DESCRIPTION    |
|------|---------|----------------|
| 001  | 1485503 | PRE-FORM PRESS |



**FINISH**— SILVER PLATE (AFTER ANNEALING) 0.015 TO 0.020 TK.  
APPROXIMATELY TO PR. S. CG. 03019. TO MAINTAIN  
MINIMUM THICKNESS CALLED ON ASSY. DRG.

**NOTE**—  
A—ANNEAL BEFORE FINISH AS FOLLOWS  
A-HEAT THE FERRULES TO 500 TO 550 SOAK AT THIS TEMPERATURE THOROUGHLY.  
B—AFTER SOAKING THE FERRULES ARE TO BE QUENCHED IN WATER.  
AFTER THE ABOVE HEAT TREATMENT THE FERRULES SHOULD HAVE A HARDNESS OF 60 H.V. MAXIMUM.

|          |         |          |          |             |             |         |            |          |      |          |           |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----------|---------|----------|----------|-------------|-------------|---------|------------|----------|------|----------|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 59       | 84      | 65       | 75       | 78          | 79          | 25      | 27         | 29       | 58   | 59       | 60        | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 00 |
| VAR. NO. | REMARKS | VAR. NO. | ITEM NO. | DESCRIPTION | DRAWING NO. | IT. NO. | MATL. CODE | UNIT WT. | QTY. | AA 12017 | 0.046 KG. |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

|   |  |  |  |                |  |  |  |   |  |  |  |  |  |  |  |
|---|--|--|--|----------------|--|--|--|---|--|--|--|--|--|--|--|
| 28—CARD TYPE 3  |  |  |  | 28—CARD TYPE 1 |  |  |  | 28—CARD TYPE 2  |  |  |  |  |  |  |  |
| ADDITIONAL INFORMATION  |  |  |  |                |  |  |  | TYPE OF PRODUCT AC EMU  |  |  |  |  |  |  |  |
| STATUS OF DRAWING M   |  |  |  |                |  |  |  | NAME OF CUSTOMER/PROJECT INDIAN RAILWAYS  |  |  |  |  |  |  |  |
| DISTRIBUTION OF PRINTS<br>OFFICE COPY 1<br>SWM 1<br>TCX (SWM) 1 |  |  |  |                |  |  |  |   |  |  |  |  |  |  |  |
| REV. DATE ALTERED<br>03 29-8-99 CHECKED PLS. JEL. APPD.         |  |  |  |                |  |  |  | DEPT. CEE GRADE OF UN. TOL. DIM. CODE REFER. 407 CG. 06503  |  |  |  |  |  |  |  |
| REV. DATE ALTERED<br>02 1-3-97 CKD. APPD.                       |  |  |  |                |  |  |  | SCALE 1:1 WEIGHT (Kg) REF TO ASSY. DRG. 3 576 10 3 0007 2 580 11 3 00026  |  |  |  |  |  |  |  |
| SILVER PLATE<br>PRS CG. 03019 WAS<br>AA 0673613                 |  |  |  |                |  |  |  | FINISH MODIFIED.<br>TOOL NO. 1485503 ADDED.<br>STYLE NO. WAS IN 6 DIGITS.<br>LENGTH OF MAT. & WEIGHT<br>ADDED IN B.O.M. |  |  |  |  |  |  |  |
| E713  |  |  |  |                |  |  |  | TITLE SHUNT END<br>CARD CODE 3 580 11 3 0040<br>DRAWING NO. 3 580 11 3 0040<br>SHEET NO. 01 NO. OF SHEETS 01            |  |  |  |  |  |  |  |

INVENTORY NO. D 8637572 (IT. 1) REF. DRG. NO. SIGN. & DATE

SIZE-A3

6000 3 09 189 3 ON 9NIMW9D

| ITEM | BRAID STYLE   | NOMINAL   |       | WIRE DIA. | STRANDING | TYPE           | SWG. NO. | NO. OF PLAITS/ 10 Cm | PURCHASING SPECIFICATION | WEIGHT Kg/Km |
|------|---------------|-----------|-------|-----------|-----------|----------------|----------|----------------------|--------------------------|--------------|
|      |               | THICKNESS | WIDTH |           |           |                |          |                      |                          |              |
| 001  | BP 9048546036 | 3         | 31    | 0.071     | 48/166    | STOCKING WOVEN | 45       | 20 TO 22             | AA 12010                 | 422.0        |
| 002  | BP 9048543223 | 1.6       | 19.05 | 0.050     | 32/113    | STOCKING WOVEN | 47       | 36 TO 38             | AA 12010                 | 80.0         |

NOTE :-  
1. TOLERANCE ON NOMINAL WIDTH & THICKNESS ±5%.

कम्प्यूटर ड्राईंग  
क 35815030009

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  
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

D.E. LOCO  
INDIAN RAILWAYS

कंप्यूटर ड्राईंग  
भारत हेवी इलेक्ट्रिकल्स लिमिटेड  
भोपाल  
BHARAT HEAVY ELECTRICALS LTD.  
BHOPAL

ड्राफ्ट्समैन  
A.S.E.

चेक  
S.C.V.

स्वीकृत  
M.B.S.

हस्ता/सिग.

दि./DATE

ड्राफ्ट की संख्या  
NO. OF VAR.

विभाग  
DEPT. CEE

उत्प. प्रमाण की नोंद  
UNTOLO DMS. GR.

उत्पाद  
SCALE

भारत की रा.  
WEIGHT (K.G.)

उत्प. ड्राईंग का संदर्भ  
REF. TO ASSY.

उत्प. संख्या  
ITEM NO.

उत्प. की संख्या  
NO. OF ITEM

कोड  
CODE 407

SEE NOTE-1

-

002-35815030020

001

002

शीर्षक/TITLE

STRANDING DETAILS FOR SHUNTS

ड्राईंग नं./DRAWING NO.

3 581 50 3 0009

पुन./REV.

01

शीट नं./SHT.NO

01

शीटों की सं./NO.OF.SHT.

01

F019




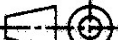
(ALL DIMENSIONS ARE IN mm)

INVENTORY NO.

|      |      |          |   |          |          |   |
|------|------|----------|---|----------|----------|---|
| REV. | DATE | ALTERED  | REV.  | DATE     | ALTERED  | ADDITIONAL INFORMATION                    |
|      |      | CHECKED  | 01  | 13.12.08 | CHECKED  | AC EMU                                    |
|      |      | APPROVED |   |          | APPROVED | STATUS OF DRAWING M                       |
|      |      |          | DRAWING COMPUTERISED & STYLE NO. WAS IN 6 DIGIT |          |          | DISTRIBUTION OF PRINTS O/C-1, TCX-1 SWM-4 |

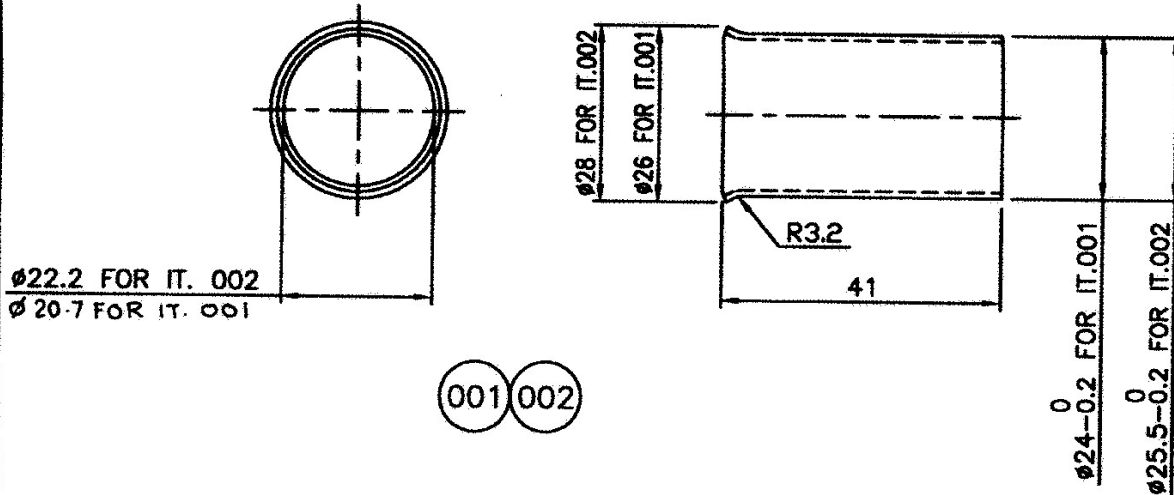
| ITEM | BRAID<br>STYLE | NOMINAL   |       | WIRE<br>DIA | STRANDING | TYPE              | SWG<br>NO. | NO.OF<br>PLAITS/<br>10CM | PURCHA-<br>SING<br>SPECIFI-<br>CATION | WEIGHT<br>kg./km |
|------|----------------|-----------|-------|-------------|-----------|-------------------|------------|--------------------------|---------------------------------------|------------------|
|      |                | THICKNESS | WIDTH |             |           |                   |            |                          |                                       |                  |
| 001  | BP9048546028   | 3         | 25    | 0.071       | 48/126    | STOCKING<br>WOVEN | 45         | 24 TO<br>26              | AA12010                               | 302.0            |

|         |          |             |     |              |        |      |                  |
|---------|----------|-------------|-----|--------------|--------|------|------------------|
|         |          |             |     |              |        |      |                  |
|         |          |             |     |              |        |      |                  |
| REMARKS | ITEM NO. | DESCRIPTION | STD | MATL. CODE   | A<br>C | UNIT | UNIT WT.<br>QTY. |
|         |          |             |     | MATL. SPECN. |        |      |                  |

|   |   |   |   |                              |   |                            |                                     |                            |  |
|---|---|---|---|------------------------------|---|----------------------------|-------------------------------------|----------------------------|--|
| कम्प्यूटर ड्राइंग<br>फाइल नम्बर 45801130027             |  |   | <b>भारत हेवी इलेक्ट्रिकल्स लिमिटेड<br/>भोपाल</b><br>BHARAT HEAVY ELECTRICALS LTD.<br>BHOPAL |                              | ड्राइंग<br>DRN.   | नाम / NAME<br>MINOD JOHN   | हस्ता / SIGN<br>sd/-                | दि./DATE<br>19.1.81        | पेज की<br>संख्या<br>NO.OF<br>VAR.<br>— |
|   |   |   |   |                              | जॉब<br>CKD.   | MANI                       | sd/-                                | 20.1.82                    |  |
|   |   |   |   |                              | स्वीकृत<br>APPD.  | VPA                        | sd/-                                | 12.2.83                    |  |
|   |   |   |   |                              |   |                            |                                     |                            |  |
| विभाग<br>DEPT.  | उम.टोल.माप की श्रेणी<br>UNTO. DIMS. GR.   |  | अनुपात<br>SCALE<br>NTS  | भार (कि.ग्रा.)<br>WEIGHT(KG) | उत्से.ड्राइंग का संदर्भ<br>REF.TO ASSY.DRG.<br>2 580 11 30026 |                            | मद क्र.<br>ITEM NO.<br>002 &<br>003 | मद संख्या<br>NO.OF<br>ITEM |  |
| शीर्षक /TITLE<br><b>STRANDING DETAILS<br/>FOR SHUNT</b> |   |   |   |                              | ड्राइंग क्र. /DRAWING NO.<br><b>4 580 11 30027</b>            |                            |                                     | पृष्ठ./REV<br>01           |  |
|   |   |   |   |                              | शीट क्र /SHT.NO 01  | शीटों की सं./NO.OF.SHT. 01 |                                     |                            |  |

(ALL DIMENSIONS ARE IN mm)

| REV.          | DATE     | ALTERED  | KE  | REV.                         | DATE    | ALTERED  | RCB | ADDITIONAL INFORMATION | AC EMU           |
|---------------|----------|----------|-----|------------------------------|---------|----------|-----|------------------------|------------------|
| 06            | 25.10.08 | CHECKED  | KSD | 05                           | 26.6.05 | CHECKED  | RKS | STATUS OF DRAWING      | M                |
|               |          | APPROVED | SKR |                              |         | APPROVED | AG  | DISTRIBUTION           | O/C - 1, SWM - 4 |
| IT.002 ADDED. |          |          |     | DRG. REDRAWN & COMPUTERISED. |         |          |     | OF PRINTS              | TCX (SWM) - 1    |
| F 992         |          |          |     |                              |         |          |     |                        |                  |

**FINISH :-**

SILVER PLATE (AFTER ANNEALING) 0.010 TO 0.015TK APPROX. TO PR.S.  
CG 03019 TO MAINTAIN MIN. THICKNESS CALLED ON ASSY. DRAWING.

**NOTE :-**

1. ITEMS 001 & 002 TO BE ANNEALED BEFORE FINISH AS FOLLOWS :-
  - a. HEAT THE FERRULES TO 500°C TO 550°C. SOAK AT THIS TEMP. THOROUGHLY.
  - b. AFTER SOCKING THE FERRULES ARE TO BE QUENCHED IN WATER. AFTER THE ABOVE HEAT TREATMENT THE FERRULE SHOULD HAVE A HARDNESS OF 60 H.V. MAXIMUM.

|         |          |                               |     |              |      |          |
|---------|----------|-------------------------------|-----|--------------|------|----------|
|         | 002      | 26 %x2.5TK.<br>COPPER TUBE    |     | AA 12016     | MM   | 0.030    |
|         | 001      | 25 O/D x 2.5TK<br>COPPER TUBE |     | AA 12016     | MM   | 0.071    |
|         |          |                               |     |              |      | 45.0     |
| REMARKS | ITEM NO. | DESCRIPTION                   | STD | MATL. CODE   | UNIT | UNIT WT. |
|         |          |                               |     | MATL. SPECN. | UNIT | QTY.     |



**BHARAT HEAVY ELECTRICALS LTD.**  
**BHOPAL**

| DEPT.  | UNTEL. | DIMS.    | GR. | SCALE | WEIGHT(KG) | NAME               | SIGN        | DATE       | NO OF VAR. |
|--------|--------|----------|-----|-------|------------|--------------------|-------------|------------|------------|
| CEE    |        |          |     |       |            | L.M.O.             | Sd/-        | 30.09.81   |            |
| CODE   | 407    | CG 06503 |     | 1:1   | -          | MANI               | Sd/-        | 16.01.82   |            |
|        |        |          |     |       |            | V.P.A.             | Sd/-        | 16.09.82   | -          |
| /TITLE |        |          |     |       |            | REF. TO ASSY. DRG. | ITEM NO.    | NO OF ITEM |            |
|        |        |          |     |       |            | ITS. 1x2           | 002         | 002        |            |
|        |        |          |     |       |            | 3 580 11 3 0036    | 002         | 002        |            |
|        |        |          |     |       |            | DRAWING NO.        | REV         |            |            |
|        |        |          |     |       |            | 4 580 11 3 0028    | 06          |            |            |
|        |        |          |     |       |            | SHT. NO            | NO. OF SHT. |            |            |
|        |        |          |     |       |            | 01                 | 01          |            |            |

**FERRULE**

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IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

8700553 (7003  
REF. DRG. NO.

SIGN & DATE

INVENTORY NO.

कम्प्यूटर डाटा  
पदार्थ क्रमांक 45801130028



## CORPORATE PURCHASING SPECIFICATION

AA 120 10

Rev. No. 03

PAGE 1 OF 4

### FLEXIBLE COPPER BRAID – ANNEALED, FLAT

#### 1.0 GENERAL:

This specification governs the quality requirements of flat flexible copper braid in annealed condition, manufactured from high conductivity copper wire, plaited in a tubular form.

#### 2.0 APPLICATION:

Used in the manufacture of flexible connections of electrical apparatus.

#### 3.0 CONDITION OF DELIVERY:

Copper braid shall be supplied in flat flexible annealed condition. The braid shall be of ordinary flexible quality or stretch wires refer Cl.6.3.

#### 4.0 COMPLIANCE WITH NATIONAL STANDARDS:

There is no Indian Standard covering this material.

#### 5.0 DIMENSIONS AND TOLERANCES:

##### 5.1 Sizes:

The Copper braid shall be supplied with the width and thickness as specified in BHEL order. The stranding of the preferred sizes are given below:

| Thickness<br>mm | Width<br>mm | No of<br>strands | Wire dia<br>mm | No of<br>braids | Effective<br>area, cm <sup>2</sup> |
|-----------------|-------------|------------------|----------------|-----------------|------------------------------------|
| 1.60            | 19.05       | 648              | 0.122          | 1               | 0.1174                             |
| 3.20            | 25.40       | 1908             | 0.152          | 3               | 0.4355                             |

The stranding of other sizes shall be as described in BHEL order

##### 5.2 Tolerances:

##### 5.2.1 Width & Thickness:

The tolerance on width and thickness shall be  $\pm 0.381$  mm measured on the braid under no compression or tension.

Revisions :

Clause:20.10.9 of MOM of MRC-NFCW+HE

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Dt :

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BHOPAL

Corp. R&D

November, 1978

# CORPORATE PURCHASING SPECIFICATION



## 5.2.2 Wire:

The tolerance on wire diameter shall be as follows:

| Nominal<br>Over | Diameter mm<br>upto & incld. | Tolerance (±) |
|-----------------|------------------------------|---------------|
| --              | 0.127                        | 0.0025        |
| 0.127           | 0.190                        | 0.0051        |

## 6.0 MANUFACTURE:

6.1 The wires for the braid shall be manufactured from copper of ETP grade conforming to IS:191.

6.2 **Braiding:** The stands shall be divided into groups of equal number and braided in tubular form. The braid shall then be flattened. The lay of the braid side shall, at the supplier's discretion, meet the flexibility and dimensional details specified.

For large number of strands the braids may be manufactured in two or more concentric tubular forms.

6.3 **Stretch wires:** Whenever specified in BHEL order, the braid shall be supplied with two parallel stretch wires of large diameter than the wire used in the braid running the whole length of the braid, to assist in controlling the width during manufacture and excessive stretching.

## 7.0 FREEDOM FROM DEFECTS:

The braid shall be clean, and free from harmful harmful defects.

## 8.0 CHEMICAL ANALYSIS:

The analysis of copper when analyzed in accordance with IS:440, shall as follows.

| Element  | Percent |       |
|--|---------|-------|
|  | Min.    | Max   |
| Copper and Silver                                  | 99.90   | ----- |
| Bismuth*   | -----   | 0.001 |
| Lead*  | -----   | 0.005 |
| Total of all impurities<br>excl. silver and oxygen | -----   | 0.030 |
| Silver present will be counted as copper.          |         |       |



## CORPORATE PURCHASING SPECIFICATION

AA 120 10

Rev. No. 03

PAGE 3 OF 4

\*These elements need not be determined when the material supplied conforms with 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

One sample per size per melt per consignment of 3 tonnes or part thereof shall be taken for chemical and electrical tests.

The sample shall be cut off cold and shall receive no further treatment before being tested.

### 10.0 ELECTRICAL RESISTIVITY (AS RECEIVED)

When measured in accordance with IS: 3635, the electrical resistivity at 20<sup>0</sup>.C shall not be greater than 0.01739 ohm-mm<sup>2</sup>/metre, which is equivalent to an electrical conductivity of 99.14%, minimum of IACS standard. (Refer Appendix B of IS: 613 for temperature correction factor).

### 11.0 INSPECTION AT SUPPLIER 'S' WORKS:

When ever 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 works, the supplier shall make Necessary arrangements for carrying out the prescribed test 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.

### 12.0 TEST CERTIFICATES:

Unless other wise stated, three copies of certificates shall be supplied along with each consignment.

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

**CORPORATE PURCHASING  
SPECIFICATION**

The test certificate shall bear the following information:

AA 12010 (Rev.03) : Flexible Copper Braid - Annealed, Flat

BHEL Order No.

Manufacturer 's/Supplier's Name:

Lot/Identification/Batch/Melt No.

Sizes and Quantity Supplied

The effective cross sectional area of the braid in square cm calculated from  $W/0.887$  where W is the weight of finished braid in kg per metre length.

Results of dimensional inspection, chemical analysis, mechanical and electrical tests as per this specification.

**13.0 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 12010 : Flexible Copper braid – Annealed, Flat

BHEL Order No.

Manufacturer's/Supplier's Name :

Lot/Identification/Batch/Melt No.

Sizes and Quantity Supplied

**14.0 REFERRED STANDARDS (Latest Publications Including Amendments):**

1. IS: 191

2. IS:440

3. IS: 613

4. IS: 3635



## CORPORATE PURCHASING SPECIFICATION

AA 120 16

Rev. No. 05

PAGE 1 OF 6

### SOLID DRAWN COPPER TUBES AND PIPES

#### 1.0 GENERAL:

This specification governs the quality requirements of solid drawn copper tubes and pipes.

#### 2.0 APPLICATION:

General engineering purposes.

#### 3.0 CONDITION OF DELIVERY: Half Hard (HB).

#### 4.0 COMPLIANCE WITH NATIONAL STANDARDS:

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

IS : 2501- 1995 : Solid drawn copper tubes for general engineering purposes  
Gr: Cu DHP

#### 5.0 DIMENSIONS AND TOLERANCES:

##### 5.1 Sizes:

The tubes and pipes shall be supplied as per the dimensions specified in BHEL order/drawing. Unless otherwise specified, tubes/ pipes shall be supplied in random lengths of 3 of 6 meters.

##### 5.2 Tolerances:

The tolerances on out side diameter, wall Thickness, length, roundness and straightness of tubes/pipes shall be as per IS : 5493, given below:

##### 5.2.1 Tolerance on mean outside diameter:

| <u>Outside diameter, mm</u> |                | Tolerances, $\pm$ mm |
|-----------------------------|----------------|----------------------|
| Over                        | Upto and incl. |                      |
| -                           | 10             | 0.08                 |
| 10                          | 18             | 0.10                 |
| 18                          | 32             | 0.12                 |
| 32                          | 50             | 0.15                 |
| 50                          | 80             | 0.20                 |
| 80                          | 125            | 0.25                 |
| 125                         | 200            | 0.50                 |
| 200                         | 250            | 0.80                 |
| 250                         | 315            | 1.00                 |

#### Revisions :

Cl: 19.10.15 of MOM of MRC-NFCW+HE

#### APPROVED :

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Dt :

Year :

HARDWAR

Corp. R&D

01-03-78

**5.2.2 Tolerance on wall thickness:**

The mean thickness of the tube shall not vary from the specified thickness by more than  $\pm 12.5\%$  of the specified wall thickness.

**5.2.3 Tolerance on length:**

| Length, meters |                | Tolerance on length,<br>mm |
|----------------|----------------|----------------------------|
| Over           | Upto and incl. |                            |
| -              | 5              | + 2.5                      |
| 5              | 7              | + 3.0                      |
| 7              | -              | + 4.0                      |

**5.2.4 Roundness Tolerance:**

The difference between major and minor diameters as determined at any one cross section expressed in terms of % of specified O.D of the tube shall be as follows:

| t / D*, mm       | Roundness Tolerance on O.D%            |
|------------------|--|
| 0.01 - 0.03      | 1.5                                    |
| Over 0.03 - 0.05 | 1.1                                    |
| Over 0.05 - 0.10 | 0.8 or 0.05 mm<br>whichever is greater |
| Over 0.10        | 0.7                                    |

\* Where t is wall thickness and D is outside diameter (O.D).

**5.2.5 Tolerance on Straightness:**

Permissible maximum deflection shall be 3 mm on any one meter length,

**6.0 MANUFACTURE:**

The tubes shall be solid drawn and subsequently annealed. In no case tubes shall be redrawn from used tubes. The ends shall be cut clean and square with the axis of the tubes.

**7.0 FREEDOM FROM DEFECTS:**

The tubes shall be reasonably straight, round, clean, smooth, uniform in diameter and free from cracks, seams, scales, slivers and other harmful defects.



**8.0 CHEMICAL COMPOSITION:**

The chemical composition of the material. When analyzed in accordance with IS:440 (Methods for chemical analysis of copper ) or any other conventional/ instrumental method shall be as follows:

| Element  | Percent |       |
|--|---------|-------|
|  | min     | max   |
| Copper (any silver to be counted as copper )                       | 99.80   | -     |
| *Antimony  | -       | 0.005 |
| *Arsenic   | -       | 0.05  |
| *Bismuth   | -       | 0.003 |
| *Iron  | -       | 0.03  |
| *Lead  | -       | 0.01  |
| *Nickel  | -       | 0.10  |
| *Selenium and Tellurium  | -       | 0.02  |
| *Tellurium   | -       | 0.01  |
| *Tin   | -       | 0.01  |
| Phosphorus   | 0.015   | 0.10  |
| *Total impurities excluding Silver, Nickel, Arsenic and Phosphorus | -       | 0.06  |

**\*Note:** These elements need not be determined when the material supplied conforms with the mechanical 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 The chemical analysis shall be performed on each heat.

9.2 Tubes of one size and thickness shall be grouped in batches of 300 tubes or 1000kg or part thereof and one tube from each batch shall be selected at random for mechanical testing.

**Note:** For tubes with wall thickness <1 mm, lot will be of 2000 tubes or part thereof.

9.3 For embrittlement , one tube shall be selected from a lot of 100 tubes or part thereof.

**10.0 MECHANICAL PROPERTIES:****10.1 Tensile test:**

A piece of tube selected for test, suitably plugged or flattened sufficiently for gripping, when tested in accordance with IS:1608 shall show the following tensile properties.

| Condition           | Tensile strength,<br>N/mm <sup>2</sup> , min. | Elongation on 5.65 $\sqrt{S_0}$ gauge length,<br>percent, minimum |
|---------------------|---|---|
| As such             | 235   | 25  |
| Strip cut from tube | 225   | 25  |

**10.2 Flattening And Doubling Over Test:**

The test pieces shall not show any crack, when tested in accordance with clause 10.2 of IS: 2501.

**10.3 Drift Expanding Test (For tubes not exceeding 100 mm in O.D):**

The tubes, when tested as per Cl. 10.3 of IS: 2501, shall be capable of undergoing drifting without showing either crack or flaw.

**11.0 NON DESTRUCTIVE TEST:**

All tubes shall meet the requirement of eddy current or by hydraulic / pneumatic test as per Clause No. 4 of IS: 2501.

**12.0 OPTIONAL TEST:****12.1 HYDROGEN EMBRITTLEMENT TEST:**

Test specimen of tubes shall be capable of meeting the requirements of hydrogen embrittlement test as per IS: 6243 (Method of hydrogen and embrittlement test of copper)

**13.0 RETESTS:**

Should any of the test pieces first selected, fail to pass the prescribed tests mentioned under various clauses in this specification, two further samples from the same batch shall be selected for testing, one of which shall be from the same component from which the original test sample was taken, unless that component has been withdrawn by the supplier.



## CORPORATE PURCHASING SPECIFICATION

AA 120 16

Rev. No. 05

PAGE 5 OF 6

Should the test pieces from both these additional samples pass the batch represented by the test sample shall be accepted. Should the test pieces from either of these additional samples fail, the batch represented by the test sample shall be rejected.

Should any specimen fail under above tests, all the tubes referred by the sample shall stand rejected. However, they may be resubmitted for inspection after stress relief treatment.

### 14.0 TEST CERTIFICATES:

Unless otherwise specified on order, three copies of test certificates shall be supplied. In addition, supplier shall sure to enclose one copy of test certificate alongwith despatch documents to facilitate quick clearance of material.

The test certificate shall bear the following information:

BHEL Order No.

AA 12016, Rev. No. 05: Solid Drawn Copper Tubes / Pipes

Batch No.

Identification Mark / No.

Weight

Supplier's Reference and Name

Results of Chemical, mechanical, hydraulic and all other tests called for.

### 15.0 PACKING AND MARKING:

The material shall be suitably packed in wooden crates to prevent corrosion and damage during transit.

Each crate shall be legibly marked with the following information.

BHEL Order No.

AA 12016

Batch No.

Identification Mark /No.

Weight

Supplier's Reference and Name

### 16.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1) IS: 440 2) IS: 2501 3) IS: 1608 4) IS: 5493 5) IS: 6243.

|             |                                    |   |
|-------------|------------------------------------|---|
| AA 120 16   | CORPORATE PURCHASING SPECIFICATION |  |
| Rev. No. 05 |                                    |   |
| PAGE 6 OF 6 |                                    |   |

### ANNEXURE - A

#### CHECK LIST FOR AA 120 16: SOLID DRAWN COPPER TUBES / PIPES (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 : Yes/No
  3. Straightness as per specification : Yes/No
  4. Chemical composition as per specification : Yes/No
  5. Mechanical properties as per specification : Yes/No
  6. Tests :
    - (1) Drift expanding : Yes/No
    - (2) Flattening : Yes/No
    - (3) Mercurous Nitrate test : Yes/No
  7. NDT tests offered :
    - (1) Hydraulic test :Yes/No
    - (2) Eddy Current test :Yes/No
    - (3) Pneumatic. :Yes/No
    - (4) Hydrogen Embrittlement :Yes/No
  8. Quality plan on BHEL format enclosed :Yes/No
  9. Details of previous experience enclosed :Yes/No.  
(For New suppliers only)
  10. Lifting Beam offered :Yes/No
  11. Packing box drg. Enclosed :Yes/No
  12. End guides included (Both ends) :Yes/No
  13. Deviations taken (Please specify clearly, if any ) :Yes/No.
    - 1
    - 2
    - 3

Date:

Place:

Signature  
and  
Seal of Supplier



# CORPORATE PURCHASING SPECIFICATION

AA 120 17

Rev. No. 02

PAGE 1 OF 5

## OXYGEN FREE HIGH CONDUCTIVITY COPPER TUBES - MEDIUM HARD

### 1.0 GENERAL:

This specification governs the quality requirements of oxygen free high conductivity copper tube, solid drawn Square/ Rectangular/Circular/ in medium hard condition.

### 2.0 APPLICATION:

Used in switchgear, transformers and traction motors.

### 3.0 CONDITION OF DELIVERY:

The material shall be supplied in medium hard condition in straight lengths as specified in BHEL order.  
Ends shall be cut clean and square with the axis of the tube.

### 4.0 COMPLIANCE WITH NATIONAL STANDARDS:

There is no Indian Standard covering this material. However, assistance has been drawn from the following national standard.

BS: 1977-1976 : Specification for High Conductivity  
Gr : C 103 Copper Tubes for Electrical Purposes.  
Medium hard

### 5.0 DIMENSIONS AND TOLERANCES:

#### 5.1 Sizes:

The tubes shall be supplied to the dimensions as specified in BHEL order.

#### 5.2 Tolerances:

##### 5.2.1 Thickness:

Tolerance on thickness shall be as follows:

| Thickness, mm |              | Tolerance, + mm |
|---------------|--------------|-----------------|
| Over          | upto & incl. |                 |
| 0.75          | 1.60         | 0.15            |
| 1.60          | 2.25         | 0.20            |
| 2.25          | 4.30         | 0.35            |
| 4.80          | 7.00         | 0.45            |
| 7.00          | 9.50         | 0.60            |
| 9.50          | 15.00        | 0.80            |
| 15.00         | 25.00        | 1.00            |

Revisions: Ref: Cl.31.2.1 of MOM of MRC –E  
& 15.27 of MRC-NFCW+HE

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Dt. Of 1<sup>st</sup> Issue  
01-11-78

Dt.: 01-02-97

Dt: 01-05-99

Year:



**5.2.2 Length:**

Tolerance on length of the tubes ordered in specified length shall be as follows:

| Length, metre |              | : | Tolerance, ± mm |
|---------------|--------------|---|-----------------|
| over          | upto & incl. |   |                 |
| --            | 3.0          |   | 1.5             |
| 3.0           | 6.0          |   | 3.0             |

For sizes not included in this specification, tolerance shall be as stated in BHEL order.

**5.2.3 Circular Tubes Diameters:**

The mean diameter of the tube shall not vary from the specified diameter by more than the amount of tolerance given below. The mean diameter is half the sum of two diameters measured at right angles at any section of the tube.

| Nominal Diameter mm |               | Tolerance mm |       |
|---------------------|---------------|--------------|-------|
| over                | up to & incl. | plus         | minus |
|                     | 15            | 0.0          | 0.13  |
| 15                  | 50            | 0.0          | 0.20  |
| 50                  | 100           | 0.0          | 0.25  |

**5.2.4 Square & Rectangular Tubes:**

The tolerances on square and Rectangular tubes shall be as agreed between BHEL and the suppliers.

**6.0 MANUFACTURE:**

The tubes shall be manufactured from copper of ETP grade conform to IS:191, except that oxygen content shall not exceed 0.001% .

**7.0 FREEDOM FROM DEFECTS:**

The material shall be clean, bright, smooth and free from spills, sealing, blisters, cracks, lappings, shaving, splinters, metal dust, oxidation and other harmful defects. However, such surface marks caused during drawing or rolling that are barely noticeable to the naked eye are allowed

Ends shall be cut clean and square with the axis of the tube.

**8.0 CHEMICAL COMPOSITION:**

The analysis of copper when analysed in accordance with IS: 440, shall be as follows.



## CORPORATE PURCHASING SPECIFICATION

AA 120 17

Rev. No. 02

PAGE 3 OF 5

| Element   | Percent |       |
|---|---------|-------|
|   | Min     | Max   |
| Copper and Silver                                 | 99.90   |       |
| Bismuth *   | -       | 0.001 |
| Lead *  | -       | 0.005 |
| Oxygen  | -       | 0.001 |
| Total of all impurities<br>excl.silver and oxygen | -       | 0.040 |
| Silver present will be counted as Copper.         |         |       |

\* These elements need not be determined when the material supplied conforms with 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:

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 material when tested in accordance with IS: 1608 shall show a tensile strength of 245 N/mm<sup>2</sup> Minimum.

#### 10.2 Hardness(Vickers):

When tested in accordance with IS: 1501,(Part 1), the material shall have a vickers hardness in the range of 75 - 90 HV.

#### 10.3 Hydraulic Test:

The tubes shall withstand, when hydraulically tested to a test pressure of 20 kg/cm<sup>2</sup> for one hour in water, and shall not show any sign of leakage or sweating or permanent increase in diameter at any point.

### 11.0 ELECTRICAL RESISTIVITY(AS RECEIVED):

When measured in accordance with IS:3635, the electrical resistivity at 20° c shall not be greater than 0.01777 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 shall also be acceptable



**12.0 OPTIONAL TESTS:**

Whenever specified in BHEL order the following tests shall be conducted on the norms of acceptance shall be as specified there in.

**12.1 Hydrogen Embrittlement Test:**

The test pieces cut from the tube (either full section or strips from the tubes) is exposed to hydrogen atmosphere at 825°C - 875°C for 30 minutes. After cooling down to room temperature the pieces are tested. In case of full section sample, the tube shall be flattened to close. In case of a strip cut from the tube, it shall be bent 180°. In no case the copper shall exhibit any crack.

**12.2 Metallographic Examination:**

After subjecting the material to the hydrogen embrittlement test, the test pieces shall be examined under an optical microscope at a magnification of at least 200. Test pieces shall show no fissures or cracks and inclusions, particularly cuprous oxide shall be absent.

**12.3 Hydrogen Resistance-Round Tubes:**

Tube specimens of 10 to 20 mm length are annealed for 30 minutes at 800 to 850° C in a reduced atmosphere (hydrogen or fuel gas) cooled and then compressed between two parallel platens until the specimen shall not show any incipient cracks or fracture at the bend. In case of thick-walled tubes or tubes of larger cross-section, a strip of about 10 mm wide can be taken as test specimen.

**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 works, the supplier shall make necessary arrangements for 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 certificates shall be supplied along with each consignment.



## CORPORATE PURCHASING SPECIFICATION

AA 120 17

Rev. No. 02

PAGE 5 OF 5

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 12017 (Rev.No.02) : Oxygen Free High Conductivity Copper  
Tube - Medium Hard.

BHEL Order No

Manufacturer's/Suppliers'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 supplied shall be suitable packed to avoid damage during transit.

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

AA 12017 : Oxygen Free High Conductivity Copper  
Tube - Medium Hard.

BHEL Order No

Manufacturer's/Supplier's Name

Lot/Idetification/Batch/Melt No. Size and Quantity  
supplied

### 16.0 REFERRED STANDARDS (Latest Publications Including Amendments)

- 1) IS: 191    2) IS:440    3) IS: 613    4) IS: 1501 (Part 1) 5) IS: 1608  
6) IS: 3635    7) BS: 1977    8) ASTM E 1004.

**Pre-Qualification requirements**

**FOR “ASSY OF SHUNT (22PC) & ASSEMBLY OF SHUNT (25 PC)”**

| <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 same or similar items of minimum 10 nos in any one of last 15 years (To be reckoned from the Bid opening date) 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 (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

| ITEM SL NO | Quoted/ Not-Quoted |
|------------|--------------------|
| 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 (wherever applicable)** for the supplied equipment throughout the warranty/AMC period.

For **(Name of OEM)**

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**Authorized Signatory**

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

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

Seal:

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