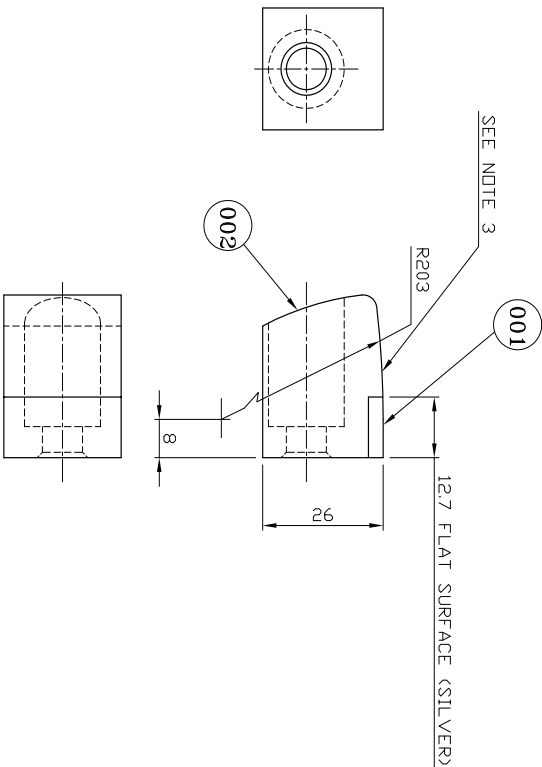


[illegible]

DRAWING NO. 3 580 11 3 0031



- NOTES :-

1. ITEMS 001& .002 TO BE SILVER SOLDERED TOGETHER.
2. VAR-00 TO BE SUITABLY PACKED TO PROTECT SURFACE FROM MECHANICAL DAMAGE.
3. MACHINE SKIM THIS SURFACE AFTER SILVER BRAZING TO GET EVEN SURFACE BETWEEN COPPER & SILVER.
4. 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

FINISH :-

SILVER PLATE VAR. 00 (0.008TK) TD PR.S. AA0673613

STYLE LIST				
STYLE	ITEM INCLUDED	DESCRIPTION OR REMARKS	RECORDED	
			SIG.	DATE
BP9048586259	VAR.00	ASSY. OF BOTTOM CONTACT	LMO	1.7.96

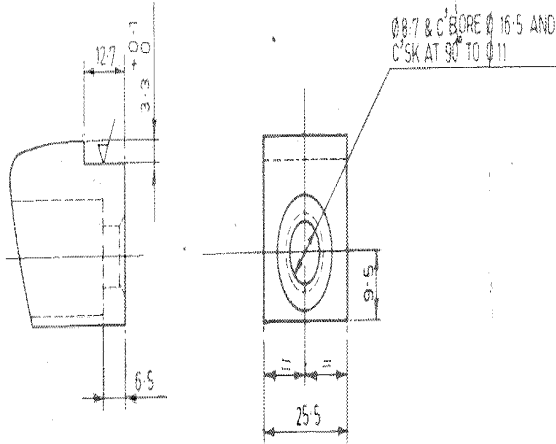
[illegible][illegible]

[illegible]


FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm.)

DRG NO 3 580 11 3 0056



TOOL LIST		
ITEM	TOOL	DESCRIPTION
001	1485919	DRILL JIG

D 8538866 (1:1)		001		BOTTOM CONTACT		3 580 11 3 0041		001		0.1836		25.5																												
VAR	00	REMARKS	ITEM NO	DESCRIPTION	STO	DRAWING NO	IT NO	MATL CODE	UNIT WT	QTY																														
CARD TYPE 3		CARD TYPE 1		CARD TYPE 2																																				
ADDITIONAL INFORMATION		TYPE OF PRODUCT A C EMU																																						
STATUS OF DRAWING M		NAME OF CUSTOMER/PROJECT INDIAN RAILWAYS																																						
DISTRIBUTION OF PRINTS		 BHARAT HEAVY ELECTRICALS LIMITED BHOPAL																																						
OFFICE COPY																																								
SWM																																								
TCX (SWM)																																								
REV		DATE	ALTERED BY	CHECKED BY	DEPT	GRADE OF UN. TOL	SCALE	WEIGHT (Kg)	REF TO ASSY DRG	ITEM NO	NO OF ITEMS																													
02		14-1-22	DRG NO 3 580 11 3 0056		CEE	407	1:1	0.1836	3 580 11 3 0031	002	001																													
TITLE		BOTTOM CONTACT																																						
CARD CODE		DRAWING NO 3 580 11 3 0056																																						
SHEET NO		NO OF SHEETS 1																																						

SIZE A3

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm.)

DRAWING NO. 3 580 12 3 0037

STYLE LIST				
STYLE CODE NO.	ITEM INCLUDED	DESCRIPTION OR REMARKS	RECORDED	
			SIGN	DATE
BP 9048586356	VAR.00	TOP CONTACT ASSY.	C.K.M	01.07.96

FINISH ::

CR

SILVER PLATE VAR-00 (0.008TK) TO PR. S. AA 0673613.

WEIGHT:-

- | | | |
|----------------------------------|--------|-----|
| 1. WEIGHT OF SILVER (ITEM 001) - | 14.08 | gms |
| 2. WEIGHT OF COPPER (ITEM 002)- | 440.00 | gms |

NOTE :-

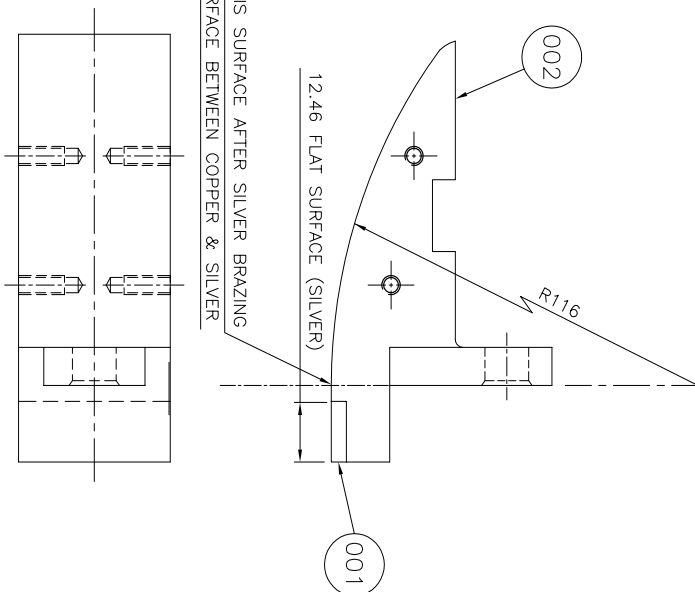
1. ITEMS-001 & 002 TO BE SILVER BRAZED TOGETHER.

2. VAR-00 TO BE SUITABLY PACKED TO PROTECT SURFACE FROM MECHANICAL DAMAGE.

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.



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[illegible][illegible]

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm.)

[illegible]

B 8700263, IT.002 REF. DRG. NO.									
SIGN. & DATE									
INVENTORY NO.									
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REV.	DATE	ALTERED	REV.	DATE	ALTERED	ADDITIONAL INFORMATION			
		CHECKED			CHECKED	AC EMU			
		APPROVED	02	29.04.05	APPROVED	STATUS OF DRAWING M			
ITEM-002 ADDED. DRG. COMPUTERISED.						DISTRIBUTION O/C - 1 SWM - 4 OF PRINTS TCX (SWM) - 1			
<div style="text-align: center;"><div>001 002</div><div><div><div>12.7</div><div>3.2</div></div><div><div>25.5 FOR ITEM-001</div><div>30 FOR ITEM-002</div></div></div></div>									
<p>NOTE :-</p> <p>1. TOLERANCE ON ALL DIMENSIONS TO BE ± 0.10</p>									
BP 9078505869		002	INSERT, 3.2TK.x12.7 99.9% PURE SILVER			Kg.	0.013 30		
		001	INSERT, 3.2TK.x12.7 99.9% PURE SILVER			Kg.	0.011 25.9		
REMARKS	ITEM NO.	DESCRIPTION		STD	MATL. CODE	A/C	UNIT	UNIT WT.	
					MATL. SPECN.			QTY.	
R/110/83									
DEPT. CBE		UNTOL. DIMS. GR.		SCALE	WEIGHT(KG)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF VAR.	
CODE 407		CG 06503		2:1	-	2 580 11 3 0031 2 580 11 3 0050	001 002	002	
/TITLE						DRAWING NO.		REV	
INSERT						4 580 11 3 0029		02	
						SHT. NO	01	NO. OF SHT. 01	

(ALL DIMENSIONS ARE IN mm)

REV. DATE	03 06.03.09	ALTERED	RCB	REV. DATE	02 25.03.05	ALTERED	RCB	-sd-	ADDITIONAL INFORMATION	AC EMU		
		CHECKED	OPS			CHECKED	RKS				-sd-	
		APPROVED	AG			APPROVED	RKS				-sd-	
DRG. COMPUTERISED.					IT. 002 ADDED.					STATUS OF DRAWING		M
										DISTRIBUTION D/C - 1		SWM - 4
										OF PRINTS		TCX (SWM) - 1

001

002

3.2

12.7


33 FOR IT.001

37 FOR IT.002


NOTE :-
TOLERANCE ON DIMNS. TO BE +0.10

STYLE NO.	002	3.2TKx12.7	99% PURE SILVER			0.016
						37.0
STYLE NO.	001	3.2TKx12.7	99% PURE SILVER			0.014
BP9078575328						33.0
REMARKS	ITEM NO.	DESCRIPTION	STD	MATL. CODE	A C UNIT	UNIT WT.
				MATL. SPECN.		QTY.

INVENTORY NO.	SIGN & DATE	DEPT. CEE	UNTEL. DIMS. GR.	SCALE	WEIGHT(KG)	NAME	SIGN	DATE	NO.OF VAR.	
						DRN.	L.M.D.	Sd/-		20.01.82
						CKD.	MANI	Sd/-		21.02.82
						APPD.	V.P.A.	Sd/-		16.09.82
कम्प्यूटर इन्फो प्रणाल कमीती 45801230025	REF. TO ASSY.DRG.	ITEM NO.	NO.OF ITEM	/TITLE		REV				
				INSERT		03				
				DRAWING NO.		4 580 12 3 0025				
				SHT.NO		01				
		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 : Cl: 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

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AA 120 23	CORPORATE PURCHASING 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

	<h2 style="margin: 0;">CORPORATE PURCHASING SPECIFICATION</h2>	AA 120 23 Rev. No. 08 PAGE 3 OF 5
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• 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 flats or Thickness, mm		Tensile strength, N/mm ² , min.			Elongation on 5.65√So of gauge length, % min.			Hardness for all shapes HV, min.	
Over	Upto & incl.	Round	Square/ Hexagonal	Rect- angular	Round	Square/ Hexagonal	Rect- 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 20⁰ C shall not be greater than 0.0177 ohm. mm² / 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.

AA 120 23	CORPORATE PURCHASING SPECIFICATION	
Rev. No. 08		
PAGE 4 OF 5		

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.


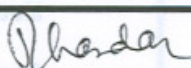
16.0 REFERRED STANDARDS(LATEST PUBLICATION INCLUDING AMENDMENTS):

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)		
<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. Tolerance on diameter/ Width/thickness/ length and flatness as per specification and drawing : Yes/No</p> <p>3. Chemical composition as per specification : Yes/No</p> <p>4. Mechanical properties as per specification : Yes/No</p> <p>5. Electrical Resistivity : Yes/No</p> <p>6. Tests : (1) Bend</p> <p>7. Details of previous experience enclosed : Yes/No. (For New suppliers only)</p> <p>C. Deviations taken (Please specify clearly, if any) : Yes/No.</p> <p style="margin-left: 100px;">1</p> <p style="margin-left: 100px;">2</p> <p style="margin-left: 100px;">3</p> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 45%;"> <p>Date:</p> <p>Place:</p> </div> <div style="width: 45%; text-align: right;"> <p>Signature &</p> <p>Seal of Supplier</p> </div> </div>		

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	PLANT PURCHASING SPECIFICATION BHOPAL		BP 19897
			REV NO. 04
			PAGE 1 OF 3
<u>HOT COPPER PRESSINGS</u>			SUPERSEDES BP 19897 Rev.03
<p>1. GENERAL:</p> <p>This specification governs the quality of high conductivity Hot Copper Pressings.</p>			
<p>2. APPLICATION:</p> <p>For electrical purposes.</p>			
<p>3. CONDITION OF DELIVERY:</p> <p>The pressings shall be supplied in the as pressed condition.</p>			
<p>4. COMPLIANCE WITH STANDARDS:</p> <p>The material shall comply with the requirements of the following National Standard and also meet the requirements of this specification.</p> <p>IS:6912 – 2005 } Copper and Copper Alloy Gr: ETP/FRHC } Forging Stock and Forging.</p>			
<p>5. DIMENSIONS AND TOLERANCES:</p> <p>As per drawing accompanying our order, the tolerance on the pressing allowed is ± 0.75 mm, unless otherwise stated.</p>			
<p>6. MANUFACTURE:</p> <p>By any convenient process of forging / pressing.</p>			
<p>7. FREEDOM FROM DEFECTS:</p> <p>The pressings must be smooth, of uniform quality & condition & shall be free from laps, cracks or other injurious defects.</p>			
<p>8. CHEMICAL COMPOSITION:</p> <p>The pressings shall be manufactured from copper conforming to our Corporate Purchasing Specification AA 12024</p>			
<p>9. TEST SAMPLES:</p>			
Revision : Reviewed and upto dated.		ISSUED by :  STANDARDS AND MATERIALS GROUP TECHNICAL SERVICES DEPARTMENT	
Rev. No 04	Date: 16.10.07	Date of first issue : Jan' 1979	

	PLANT PURCHASING SPECIFICATION BHOPAL	BP 19897
		REV NO. 04
		PAGE 2 OF 3

9.1 One sample per heat shall be taken for chemical analysis.


9.2 In any consignment, all the pressings produced from the same batch of raw material under similar conditions shall be grouped together to constitute a lot. One sample per heat / lot shall be taken for mechanical tests. The test pieces shall be taken directly from pressings and shall receive no further heat treatment.

9.3 Electrical conductivity measurement shall be performed on each sample, per lot, as above.

10. **HARDNESS-VICKERS:**
The material when tested in accordance with IS:2866 shall show a Vicker's Hardness of 45-60 HV.

11. **ELECTRICAL CONDUCTIVITY:**
When tested in accordance with ASTM E 1004, Eddy current probe test method, the electrical conductivity shall be 95% minimum of I.A.C.S standard for annealed copper (0.01724 ohm mm² / m at 20°C is the resistivity corresponding to 100% conductivity).
Refer IS: 613 Appendix - B for temperature correction factor.

12. **TEST CERTIFICATES:**
Three copies of test certificates shall be supplied, unless otherwise stated on the order.
The supplier shall ensure, to enclose one copy of the above test certificate along with their despatch documents to facilitate quick clearance of material.
The test certificate shall bear the following information.
BP 19897 (Rev.04) Hot Copper Pressing.
BHEL Order No.
Supplier's Name.
Drawing No.
Method of Manufacture.
Consignment/Identification No.

 TSD 6207A	PLANT PURCHASING SPECIFICATION BHOPAL	BP 19897
		REV NO. 04
		PAGE 3 OF 3
<p><u>Results of tests :</u></p> <p>Results of chemical analysis, mechanical test & electrical conductivity, dimensional tolerances and all other tests called for in this specification/order.</p> <p>13. PACKING AND MARKING</p> <p>The pressings shall be suitably packed to prevent corrosion and damage during transit. Machined surfaces, if any shall be properly protected with anti-corrosive compounds.</p> <p>Each package shall be marked with the following information.</p> <p>BP 19897 : Hot Copper Pressing.</p> <p>BHEL Order No.</p> <p>Identification No.</p> <p>Weight.</p> <p>Supplier's reference / Name.</p>		