कदम कदम मिलाना है ग्राहक सफल बनाना है

Marching Towards Business Excellence

BPC 0007

ENQUIRY

TWO PART BID

E-TENDER

भारत हैवी इलेक्ट्रिकल्स लिमिटेड, पिपलानी, भोपाल– ४६२०२२ (भारत)

सामग्री प्रबंधन विभाग

BHARAT HEAVY ELECTRICALS LIMITED, PIPLANI, BHOPAL–462022 (INDIA)

MATERIALS MANAGEMENT DIVISION

TIN NO- 23573000001 | ECC NO- AAACB4146PXM009 | MPCT NO- HEL/05/01/0001/S15/11/79

PHONE NO : 91-755-2500100 FAX : 91-755-2500023 www.bhel.com

ENQUIRY NO	E5953037
ENQUIRY DATE	11/09/25
ENQUIRY DUE DATE	22/09/25

ENQUIRY

SUPP NAME AND ADDRESS	SUPP CODE	REV CD	REV NO	REV DATE	NO OF CATY2	NO OF CATY3	ENQ NO OF ITEMS	INDENT NO
	0	1	0	NA	2	2	2	121359522

GUARANTEE CERTIFICATE	Y	**SUPPLY CONDITION**	SUPPLIER`S IDENTIFICATION MARK SHOULD BE ON EACH JOB.
TEST CERTIFICATE	Y		
INSTRUCTION BOOKLET	N	**TECHNICAL CONDITION**	AS PER DRG.
SAMPLE	N		
GATE PASS	Y	**INSPECTION CONDITION**	BY BHEL AUTHORISED TPIA AT VENDORS WORK.

NOTE: QUOTE PRICE BOTH IN FIGURES & WORDS.IN CASE OF MISMATCH PRICE IN WORDS WILL BE VALID,QUOTATIONS NOT BEARING ENQUIRY NO AND DUE DATE LIABLE TO BE REJECTED.

SL NO	MATERIAL CODE	DESC	UNIT	ITEM QTY	QTY VR%	LOT NO	LOT QTY	DEST	DELIVERY DATE
1	BP9094585243	AG 3101 AZ / AX BRUSH HOLDER CLAMP TO DRG.NO. 34332022003 V00 REV.06. MORGAN TYPE AA1313/3502 SUB-D. NOTE : (1)PLATING AS PER DRG. INSTRUCTION . JOB TO BE SUPPLIED INPOLY BAGS CONTAINING 100 NOS EACH BAG	NO	900.000	**30**	1	900.000	213	08/11/25
2	BP9094585030	AG2702,AG 51, AG 2513 , AG 2501 BRUSH HOLDER CLAMP TO DRG. NO. 34332017002 V00 REV. 06 (ASSY. OF IT. 01 TO 08.NOTE : 1) SUPPLIER'S IDENTIFICATION TO BE PUNCHED ON IT. 01 OF EACH JOB .2) PLATING AS PER DRG. TO BE SUPPLIED IN PROPER PACKING. (10 NOS. EACH PACKING.)	NO	800.000	**30**	1	800.000	213	08/11/25

REMARK FOR DETAILS REFER NIT DETAILS FLOATED AT NIC

DRAWING Y **PURCH SPEC** Y **CATALOUGE** N **Quality Surveillance Pla** Y **TWO PART BID** Y

NOTE:BHEL,BHOPAL'S Standard Terms & Conditions BP200102 (Latest Revision) form a part of this Enquiry. Bidders may obtain from us copies of these terms and conditions if not already available.

Note: During Bid Evaluation, No loading of price with regard to preferential payment of within 45 days will be made on vendore falling under MSMED ACT - OCT 06

Please submit your lowest quotation in sealed envelop essentially superscribed with ENQUIRY NO, DUE DATE AND PARTY'S NAME so as to reach at TENDER ROOM, GROUND FLOOR, ADM BUILDING, BHEL, PIPLANI BHOPAL-462022 by 11.00 am of due date.

SPECIAL REMARK: Bid to be submitted through e-procurement. Refer eproc link on BHEL Bhopal B2B site.

1.This is only a request for Quotation & not an order.
2.Small Scale industries should indicate SSI Regn. No. in Quotation/invoice.
3.In case you are not making an offer against this Enquiry, we request you to post a regret letter.
4.Indian vendors to please indicate GSTIN on their quotation.

Documents Enclosed

1.Drawing. 3.Purchase specification.
2.Catalogue. 4.Quality Surveillance Plan.

NAME : SHRI MANENDRA SINGH
DESG : DY.MANAGER
0755-2505880
manendra1@bhel.in

SIGN & SEAL

RPT-160

ENQUIRY

BHEL ENQUIRY NO. E5953037
DUE ON 22-09-2025

NIT TERMS & CONDITIONS:

SL. NO.	DESCRIPTION	DETAILS
1.	RATE CONTRACT TERMS	We intend to enter into a Rate Contract (RC) for ordering up to 12 months from RC freeze date, i.e. RC is to be kept valid for ordering up to 12 months from RC freeze date. Purchase Ordering shall be done as per BHEL requirement against the finalised rate contract & within its validity. Dispatches to be made against our purchase order (computerized) only, which will be issued against this Rate Contract. BHEL reserves the right to cancel/ short close the Rate Contract for unordered qty at any point of time even before the expiry of RC validity without assigning any reason whatsoever it may be.
2.	ITEM DESCRIPTION	**Item01: -** AG 3101 AZ / AX BRUSH HOLDER CLAMP TO DRG.NO. 34332022003 V00 REV.06. MORGAN TYPE AA1313/3502 SUB-D. NOTE :- (1) PLATING AS PER DRG. INSTRUCTION. JOB TO BE SUPPLIED INPOLY BAGS CONTAINING 100 NOS EACH BAG. **Item02: -** AG2702, AG 51, AG2513, AG 2501 BRUSH HOLDER CLAMP TO DRG. NO. 34332017002 V00 REV. 06 (ASSY. OF IT. 01 TO 08. NOTE :- 1) SUPPLIER'S IDENTIFICATION TO BE PUNCHED ON IT. 01 OF EACH JOB .2) PLATING AS PER DRG. TO BE SUPPLIED IN PROPER PACKING. (10 NOS. EACH PACKING.)
3.	TECHNICAL CONDITION	As per attached list of attached Drawings & Spec.
4.	QUANTITY	**Item01- 90**0 nos **Item02- 80**0 nos
5.	QUANTITY VARIATION	± 30% for each item
6.	SPLITTING OF ORDER	Not Applicable
7.	DELIVERY SCHEDULE REQUIREMENT	For the single lot of 900 Nos. for item 01 & 800 Nos for item 02. scheduled delivery date shall be within 60 days from the PO date. Early delivery acceptable.
8.	DELIVERY TERMS	FOR Destination (BHEL Bhopal)
9.	DELIVERY INSTRUCTION	Supplier identification (viz. Vendor code, PO number, sn etc) is must on each job.
10.	QAP	Applicable
11.	INSPECTION CONDITION	BY BHEL AUTHORISED TPIA AT VENDORS WORK.
12.	SAMPLE	As per attached Drg, Spec & QAP (As applicable)
13.	TEST CERTIFICATE	All Material TC to be supplied along with material as per drg Spec. TC should incorporate Spec.
14.	GUARANTEE / WARRANTY	As per BHEL GTC of ENQUIRY (BP200102B, Cl. No. 18)

15.	**GUARANTEE/ WARRANTEE CERTIFICATE**	GUARANTEE/ WARRANTEE Certificate to be supplied along with each lot of the material.
16.	**INVOICE & DOCUMENTS SUBMISSION FOR PAYMENT.**	For supply orders placed on Indian Suppliers: Irrespective of the value of the invoice amount, the bidder / vendor should necessarily upload the despatch & invoice details on BHEL SUVIDHA portal at https://suvidha.bhel.in/suvidha/, prior to despatch. All documents as per PO checklist, along with additional documents (if any), must be uploaded on the portal. It is mandatory that tax invoices with a net amount (including taxes) exceeding Rs five lakhs uploaded on the portal are digitally signed using a Class 3 Digital Signature Certificate (DSC) issued by a licensed Certifying Authority. Submission of invoice document in hard copy is allowed for invoices with a net amount (including taxes) equal to and upto Rs five lakhs, in case they were not digitally signed and uploaded on the portal. The material will not be accepted inside BHEL in absence of the above.
17.	**PAYMENT TERMS**	As per attached BHEL GTC of ENQUIRY (BP200102B, Cl. No. 16) i.e. 100% payment in 90 days of receipt (**45 days for Micro & Small and 60 days for Medium enterprises as registered in Udyam Certificate as per relevant MSME act in force**) and subject to acceptance of material and relevant documents at BHEL. Any deviation from the above payment terms, if accepted (by BHEL), shall be loaded @ SBI base rate + 6% for the purpose of bid evaluation.
18.	**TECHNICAL PQR (T-PQR)**	Technical Pre-Qualification Requirements (T-PQR) for procurement of the items is attached with the NIT. Compliance of all the points in T-PQR is mandatory. In absence of compliance of above and non-submission of documents required against the T-PQR, the Vendor's offer is liable to be rejected. **Duly filled T-PQR with desired documents shall be submitted by the Vendor along with the offer.** *Information/ compliance/ documents submitted by vendor shall be authentic in all aspects. In case any deviation/ false information/ forged documents are observed / revealed later on, BHEL is free to initiate appropriate punitive proceeding against the Vendor as per Prevalent Processes and Guidelines of Company.*
19.	**FINANCIAL PQR (F-PQR)**	*Not Applicable.*
20.	**BID PARTS**	Offer shall be submitted by the bidders in Two Parts, i.e. **Part-I Technical cum Commercial bid & Part-II Price bid.**
21.	**PENALTY / LD**	As per attached BHEL GTC of ENQUIRY (BP200102B, Cl. No. 9) i.e. **0.5% of the undelivered portion per week of delay or part thereof, subject to a maximum of 10% of the undelivered order value owing to delayed delivery.**
22.	**PRICE BASIS**	Firm Price basis
23.	**PRICING TERMS**	As per attached BHEL GTC of ENQUIRY (BP200102B, Cl. No. 12)
24.	**PRICE VALIDITY**	As per attached BHEL GTC of ENQUIRY (BP200102B, Cl. No. 13) i.e. **Offer shall be valid for a period of 90 days from the date of Techno- commercial (Part-I) bid opening date.**
25.	**TAXES & DUTIES**	As per attached BHEL GTC of ENQUIRY (BP200102B, Cl. No. 14)

26.	**EVALUATION CRITERIA**	Overall L1 basis.
27.	**EVALUATION IN CASE OF MORE THAN ONE L-1 BIDDER**	In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders. In case more than one bidder happens to occupy the L-1 status even after soliciting discounts, the L-1 bidder shall be decided by a toss/draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s). Ranking will be done accordingly. Decision of BHEL in such situations shall be final and binding.
28.	**BID SECURITY/ Earnest Money Deposit (EMD)**	Not Applicable
29.	**PERFORMANCE SECURITY (PBG)**	**Not Applicable.**
30.	**REVERSE AUCTION**	**Not Applicable.**
31.	**MSE PREFERENCE**	Applicable as per attached BHEL GTC of ENQUIRY (BP200102B, Cl. No. 29)
32.	**PUBLIC PROCUREMENT (PREFERENCE TO MAKE IN INDIA)**	**Applicable** as per attached BHEL GTC of ENQUIRY (BP200102B, Cl. No. 33). Tendered qty is not divisible, hence 100% qty for the Purchase preference shall be eligible. For this procurement, the local content to categorize a supplier as a Class I local supplier/ Class II local Supplier/ Non-local supplier and purchase preference to Class I local supplier, is as defined in Public Procurement (Preference to Make in India), Order 2017 dated 19.07.2024 issued by DPIIT. In case of subsequent orders issued by the nodal ministry, changing the definition of local content for the items of the NIT, the same shall be applicable even if issued after issue of this NIT, but before opening of Part-II bids against this NIT. The local content to categorize a supplier as a Class-I local supplier / Class-II local supplier / Non-Local supplier and purchase preference to Class-I local supplier, is as defined in above circular issued by DPIIT/ Nodal Ministry. Bidders to also inform the **Actual Percentage of the Local Content** and the **Complete Address of the Location of Local Value Addition** as per the **attached MII format**, failing which no purchase preference shall be granted. In case the bid value is more than Rs. 10 Crore, the declaration relating to the Actual Percentage of the Local Content and the Complete Address of the Location of Local Value Addition shall be **Certified by the Statutory Auditor or Cost Auditor, if the OEM is a Company and by a Practicing Cost Accountant or a Chartered Accountant for OEM other than Companies** as per the above circular. For contracts valuing more than Rs 10 Crores, local content (in cases of self-certification submitted by bidders at the time of tendering) will be re-verified during execution of contract by Cost/ Chartered Accountant/ **Statutory Auditor/Cost Auditor (as applicable)**

		and in case of defaults, penalty upto 10% of the contract value shall be imposed. However, contract once awarded shall not be terminated on this account. *Bidders or successors can be debarred for false declarations for up to 2 years. Debarred suppliers not eligible for preference in any other procuring entity.*
33.	**INTEGRITY PACT (IP)**	**Not Applicable.**
34.	**RESTRICTION UNDER RULE 144 (xi) GFR**	As per attached BHEL GTC of ENQUIRY (BP200102B, Cl. No. 34)
35.	**CONFLICT OF INTEREST AMONG BIDDERS/ AGENTS AND THEIR DECLARATION**	A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Procuring Entity's interests. **Bidders having a conflict of interest shall not be eligible to participate in the tender process.** **Treatment of cases regarding conflict of interest: -** The bidder notes that a conflict of interest would said to have occurred in the tender process and execution of the resultant contract, in case of any of the following situations: - i) If its personnel have a close personal, financial, or business relationship with any personnel of BHEL who are directly or indirectly related to the procurement or execution process of the contract, which can affect the decision of BHEL directly or indirectly; ii) The bidder (or his allied firm) provided services for the need assessment/ procurement planning of the Tender process in which it is participating; iii) Procurement of goods directly from the manufacturers /suppliers shall be preferred. However, if the OEM/ Principal insists on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer/ supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer/ supplier or the manufacturer/ supplier could bid directly but not both. In case bids are received from both the manufacturer/ supplier and the agent, bid received from the agent shall be ignored. However, this shall not debar more than one Authorised distributor (with/ or without the OEM) from quoting equipment manufactured by an Original Equipment Manufacturer (OEM) in procurements under a Proprietary Article Certificate. iv) A bidder participates in more than one bid in this tender process. Participation in any capacity by a Bidder (including the participation of a Bidder as a partner/ JV member or sub-contractor in another bid or vice-versa) in more than one bid shall result in the disqualification of all bids in which he is a party. However, this does not limit the participation of an entity as a sub-contractor in more than one bid if he is not bidding independently in his own name or as a member of a JV. The Bidder declares that they have read and understood the above aspects, and the bidder confirms that such conflict of interest does not exist and undertakes that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or

		informal with other Bidder(s), in this regard. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. **In case, the Bidder is found having indulged in above activities, the same will be considered as a violation of the tender conditions, and suitable action shall be taken by BHEL as per extant policies/ guidelines.**
36.	**ANNEXURE-IX**	The Bidder/Supplier/Contractor will, when presenting his bid, declare whether other Family Firms or Sister Concern Affiliates/Subsidiary firms are participating in the same tender, so as to eliminate the possibility of cartel formation. Format for declaration is available in the NIT documents for this enquiry (Annexure-IX). **Same is to be submitted with the offer.**
37.	**SPECIAL CONDITIONS**	Bidders who fall under MSE (Micro & Small Enterprises only) and **fail to upload 'UDYAM Registration Certificate (URC)' shall automatically be considered as Non-MSE supplier for this tender**. Further, it is to be noted that **MSE benefits are not being extended to Agent/ Dealer/ Trader/ Distributor (i.e. Other than manufacturer)**. Supplier has to also provide supporting document(s) such as Agreement Between OEM & Bidder(s) etc. Identification must. Soon after rejection of material, it is to be ensured by supplier that material should be taken back maximum within two weeks after communication for rectification/ replacement & supply back the rectified/ fresh material to BHEL Bhopal within 30 days from rejection. In the event of non-lifting of rejected material by supplier, BHEL will not be responsible for loss of such items to the supplier in any case. **Offers of suppliers who are in 'HOLD/BANNED' status in BHEL Bhopal PMD shall not be considered.** Unregistered vendors to submit documents required for registration to BHEL Portal Online (https://bhel.com/supplier-registration).
38.	**OTHER TERMS & CONDITIONS**	Other Terms & Conditions as per attached BHEL GTC of ENQUIRY (BP200102B). Any deviation of NIT, BHEL GTC of ENQUIRY (BP200102B) and BHEL PO Terms, where vendor response is not affirmative to be clearly indicated, else BHEL will consider that all above Terms & Conditions are acceptable to vendors.
39.	**GEM REGISTRATION**	As you are kindly aware that Government e-Marketplace (GeM) is a one stop portal to facilitate Online Procurement of Goods & Services required by various Government Departments/ Organizations/ PSUs. BHEL being a PSU, would like that its suppliers/ contractors also have visibility on this portal so that GeM can be used for procurement by BHEL. Hence, you are requested to get yourselves registered on GeM.
40.	**TENDER FEE**	Not applicable
41.	**BID SUBMISSION WITHIN DUE DATE & TIME**	No request for extension of tender due date will be entertained at the time of tender opening and after due date under any circumstances. Hence, all bidders are requested to submit their bid well within due date and time only. ***BHEL reserves the right for extension of tender based on the situation without assigning any reason whatsoever it may be.***
42.	**DOCUMENTS TO BE**	**Signed and Sealed copy of:** - NIT

	FURNISHED ALONG WITH YOUR QUOTATION	- BHEL GTC of ENQUIRY (BP200102B) - BHEL PO Terms **Duly Filled, Signed and Sealed copy of:** - Techno-Commercial Annexure - T-PQR along with all supporting documents - **Annexure-IX** in Company Letterhead - Annexure A for OEM & MSE Declaration. - PPP-MII Certificate for local content - **Others:** - UDYAM Registration Certificate (*as applicable for MSME bidders only*)

IT IS HEREBY MENTIONED THAT THIS IS E-TENDER SO OFFER SUBMITTED THROUGH E-PROCUREMENT PORTAL (www.eprocurebhel.co.in) SHALL ONLY BE CONSIDERED.

Techno-Commercial Annexure

(To be filled by supplier inline with NIT requirement and submit with offer)

Tender No.	**E5953037 due on 22/09/2025**
Description :	**Item01:** - AG 3101 AZ / AX BRUSH HOLDER CLAMP TO DRG.NO. 34332022003 V00 REV.06. MORGAN TYPE AA1313/3502 SUB-D. NOTE :- (1) PLATING AS PER DRG. INSTRUCTION. JOB TO BE SUPPLIED INPOLY BAGS CONTAINING 100 NOS EACH BAG. **Item02:** - AG2702, AG 51, AG2513, AG 2501 BRUSH HOLDER CLAMP TO DRG. NO. 34332017002 V00 REV. 06 (ASSY. OF IT. 01 TO 08. NOTE :- 1) SUPPLIER'S IDENTIFICATION TO BE PUNCHED ON IT. 01 OF EACH JOB .2) PLATING AS PER DRG. TO BE SUPPLIED IN PROPER PACKING. (10 NOS. EACH PACKING.) **TENDER QTY.:-** Item01: - 900 nos +/-30%, Item02: - 800 nos +/-30%. **Delivery required as per NIT.**

Sr. No.	ELEMENTS	Standards	To be offered/confirmed by supplier	Remarks, if any
1	Quotation reference no. & date	As per supplier		
2	HSN / SAC code	As per supplier		
3	Quotation currency	In INR		
4	Contact person	As per supplier		
5	Phone / Mobile	As per supplier		
6	E-Mail	As per supplier		
7	Order to be placed on (Also provide supplier code at BHEL Bhopal, If registered)	As per supplier		
8	Address	As per supplier		
9	Please specify delivery in weeks/ days (Specify item wise, lot wise as per RFQ)	As per NIT/ Accepted with deviation (If select Accepted with deviation, please mention the deviation)		
10	Rate quoted on "Firm" price basis	Yes		
11	Quoted for all the items and full quantity of tender enquiry	Yes / No. (If "No" please mention item number with Qty of regreted items)		
12	Technical specifications	Accepted as per NIT / Accepted with deviation (If select Accepted with deviation, please mention the deviation)		
13	Inspection	As per NIT/ Accepted with deviation (If select Accepted with deviation, please mention the deviation)		
14	Test certificate & Gurantee certificate as per NIT and specification will be submitted along with each consignment	Yes (In case of "No" your offer may be rejected).		
15	Brand name, if any.	As per supplier		
16	Supply from	As per supplier		
17	Terms of delivery ("FOR DESTINATION " means freight & insurance upto destination in supplier's scope (Destination: CRX Divn, BHEL Bhopal)	Accepted/ Accepted with deviation (If select Accepted with deviation, please mention the deviation)		
18	Transit insurance (In supplier's scope)	As per NIT/ Accepted with deviation (If select Accepted with deviation, please mention the deviation)		
19	CGST RATE (IN %)	As per supplier		
20	SGST RATE (IN %)	As per supplier		
21	IGST RATE (IN %)	As per supplier		
22	UGST RATE (IN %)	As per supplier		
23	Are you manufacturer of quoted item (s).	Yes / No		
24	Are you registered under MSMED ACT 2006 as small or micro. NOTE: - Firms registered under medium scale shall not be considered eligible for MSE benefits.	Yes / No (If select Yes, please enclosed valid UDYAM certificate)		

Techno-Commercial Annexure

(To be filled by supplier inline with NIT requirement and submit with offer)

Tender No.		**E5953037 due on 22/09/2025**		
Description :		**Item01:** - AG 3101 AZ / AX BRUSH HOLDER CLAMP TO DRG.NO. 34332022003 V00 REV.06. MORGAN TYPE AA1313/3502 SUB-D. NOTE :- (1) PLATING AS PER DRG. INSTRUCTION. JOB TO BE SUPPLIED INPOLY BAGS CONTAINING 100 NOS EACH BAG. **Item02:** - AG2702, AG 51, AG2513, AG 2501 BRUSH HOLDER CLAMP TO DRG. NO. 34332017002 V00 REV. 06 (ASSY. OF IT. 01 TO 08. NOTE :- 1) SUPPLIER'S IDENTIFICATION TO BE PUNCHED ON IT. 01 OF EACH JOB .2) PLATING AS PER DRG. TO BE SUPPLIED IN PROPER PACKING. (10 NOS. EACH PACKING.) **TENDER QTY.:-** Item01: - 900 nos +/-30%, Item02: - 800 nos +/-30%. **Delivery required as per NIT.**		
Sr. No.	**ELEMENTS**	**Standards**	**To be offered/confirmed by supplier**	**Remarks, if any**
25	Terms of Payment (100% payment in 90 days of receipt (45 days for Micro & Small and 60 days for Medium enterprises as registered in Udyam certificate as per relevant MSME act in force) and subject to acceptance of material and relevant documents at BHEL. Pl refer GTC BP200102B)	As per NIT/ Accepted with deviation (If select Accepted with deviation, please mention the deviation)		
26	SELF CERTIFICATION OF MINIMUM LOCAL CONTENT, IF MORE THAN 50% VALUE ADDITION IS IN INDIA. (Note- In case of tenders worth more than Rs. 10 crores, Suppliers shall necessarily submit certificate from statutory auditor or cost auditor or cost accountant or CA) Please also specify the amount of local content in India. EXAMPLE :if 100% INDIGENOUS (MADE IN INDIA) MARK "Y"/100%	As per supplier/~~not applicable~~		
27	Details of location of value addition / manufacturing	As per supplier/~~not applicable~~		
28	Other Charges (If any)	Applicable / Not Applicable. (If applicable please mention percentage (%) / Value (along with type of charges).		
29	Penalty for delayed performance as per BP200102B & NIT	Yes / No (In case of "No", your offer will be loaded suitably)		
30	Confirmation that documents pertaining to technical PQR has been submitted	Yes / No		
31	Acceptance to "REVERSE AUCTION" if conducted (As per BHEL's RA policy)	Not applicable		
32	Submission of Declaration format with duly sealed & signed (Annexure IX, refer attached) regarding whether other family firms or sister concern affiliates / subsidiary firms are participating in the same tender.	(Yes / No) If No please specify the reason.		
33	General terms and conditions of enquiry (Form No. BP-200102B) and BHEL PO Terms & Conditions is Acceptable.	Yes (In case of "No" your offer may be rejected).		
34	Quotation Validity will be 90 days from the date of techno-commercial bid opening.	Yes		
35	Tender fees submitted	Yes / Not Applicable	Not Applicable	

Technical Pre-Qualification Requirement (PQR) for procurement of Brush Holder Clamp

Ref. No. TME/AG BHClamp **Date: 12.07.25**

Sl. No.	Description	Vendor to provide Supporting relevant document /Comments	
		Complied / Not complied	Supporting relevant document to be submitted
1.	Offered item should be exactly as per drawing and specification mentioned in tender enquiry/ NIT.	Yes/No	Deviation if not accepted
2	Supply experience in preceding 5 years (from tender opening date) of same/similar * item to rotating traction machine manufacturer or Indian Railways.	Yes/No	Un-price PO copies & corresponding proof of supply (delivery challan / invoice etc.)

Note:

1) ***Brass based brush holder & brass base holding clamp shall be considered as same or similar item.**
2) **Compliance of above PQR is mandatory. In absence of compliance of above, vendor's offer is liable to be rejected.**

Prepared By:	Approved by:
	
Shishu Pal Sr.Mgr./TME	V. Rawtiya Sr.DGM./ TME

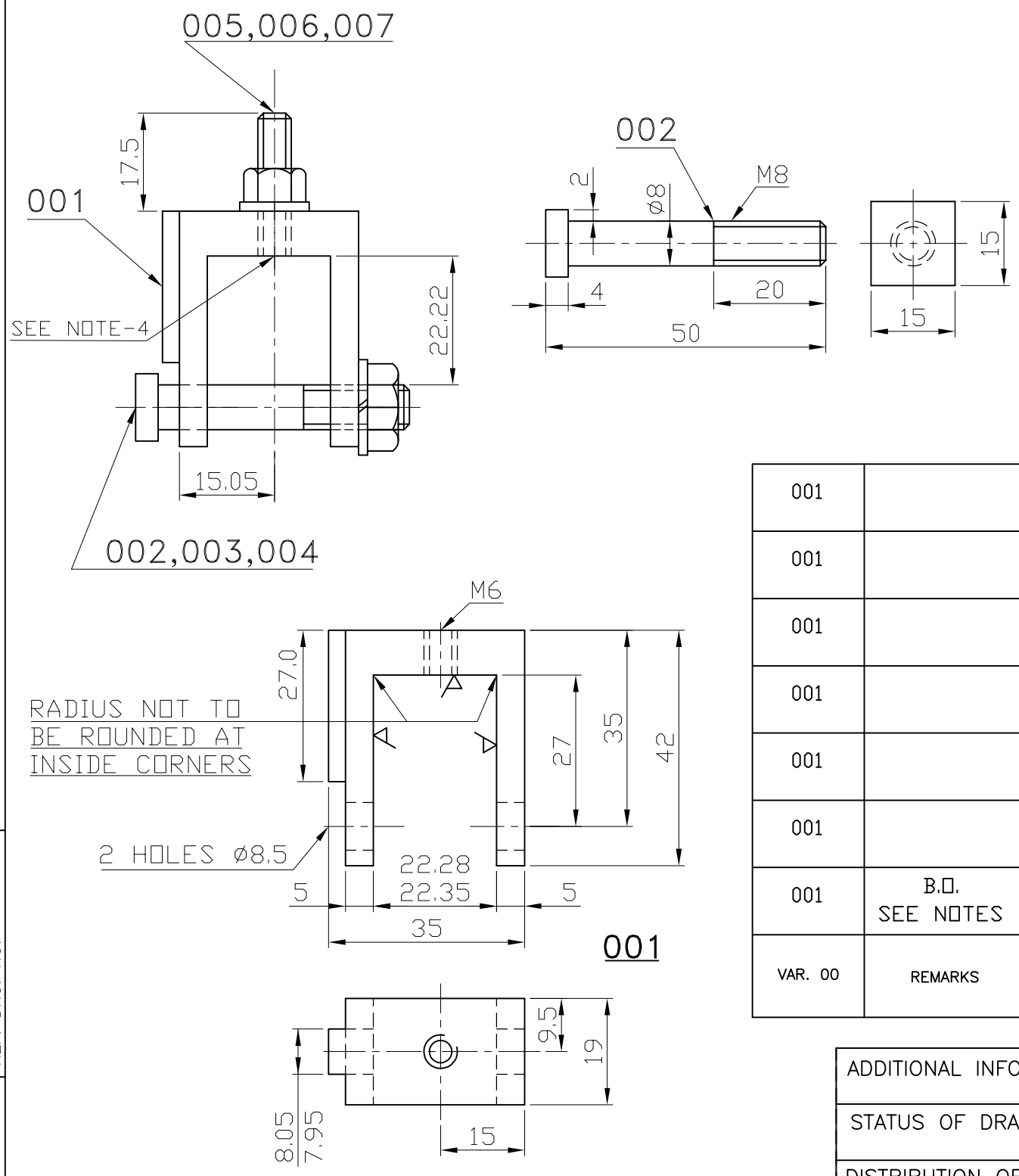
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm.)

DRAWING NO. 34332022003

STYLE LIST		
VAR	IT.NO.	STYLE NO.
00	–	BP9094585243

TOOL LIST		
IT.NO.	TOOL NO.	DESCRIPTION
	1402932	SLOT CHECKING GAUGE 22.22/22.35 SQ.



NOTES:–

1 BRASS TO BE TIN PLATED TO AA0673602, WITH A PLATING TK. OF 0.008 MM MIN.
2 ITS.002,004,005,006,007 TO BE ZINC PLATED TO AA0673603 AND PASSIVATED TO AA0673604 WITH A PLATING THICKNESS OF 0.013 TO 0.015 MM.
3 IT.003 TO BE PARKERISED TO PROCESS AA0673616.
4 BRAZE STUD IT.005 WITH IT.001 AND FLUSH TO M/CD SURFACE AS SHOWN.
5 TOLERANCE FOR ALL UNTOLERATED DIMNS.±0.1 MM.

VAR. 00	REMARKS	VAR NO.	ITEM NO.	DESCRIPTION	STD.	DRAWING NO.	IT. NO. / VAR	MATL. CODE. / MATL. SPCN.	A/C	UNIT	UNIT WT. / QTY.	GS.
001			007	HEX. NUT C-M6-4				AA7151131011 / AA7151131	NA	Kg	0.003	
001			006	WASHER B 6.4 ST				AA7161001048 / AA7161001	NA	Kg	0.001	
001			005	SCREW STUD AM6×25/4.6 ST	1			/ AA7121123	NA	Kg	0.004	
001			004	HEX. NUT C-M8-4				AA7151131020 / AA7151131	NA	Kg	0.003	
001			003	SPRING WASHER SC B-8-ST.				AA7164002053 / AA7164002	NA	Kg	0.002	
001			002	SQ. HD. BOLT				/ IS 1367(P3)	NA	Kg	0.05	
001	B.O. SEE NOTES		001	BODY (BRASS) 19TK.x35x42 LG.	1			/ AA12114	NA	Kg		

R / /

ADDITIONAL INFORMATION

STATUS OF DRAWING

DISTRIBUTION OF PRINTS
TME – 1
TAM – 4
TNX – 1

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: AG–3101 AZ/AY

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

	NAME	SIGN.	DATE	NO. OF VAR.
DRN.	V.R.D.	SD/–	11.4.96	01
CKD.	A.G.B.	SD/–	11.4.96	
APPD.	APS/PGS	SD/–	9.5.96	

DEPT. / CODE.	GRADE OF UNTOL. DIMS. GR.	SCALE	WEIGHT (K.G.)	REF. TO ASSY.	ITEM NO.	NO. OF ITEM
TME / 405	–	NTS	0.12	14332022001	002	007

TITLE: BRUSH HOLDER CLAMP ASSY.

DRAWING NO. 34332022003 REV. 06

SHT.NO 01 NO.OF.SHT. 01

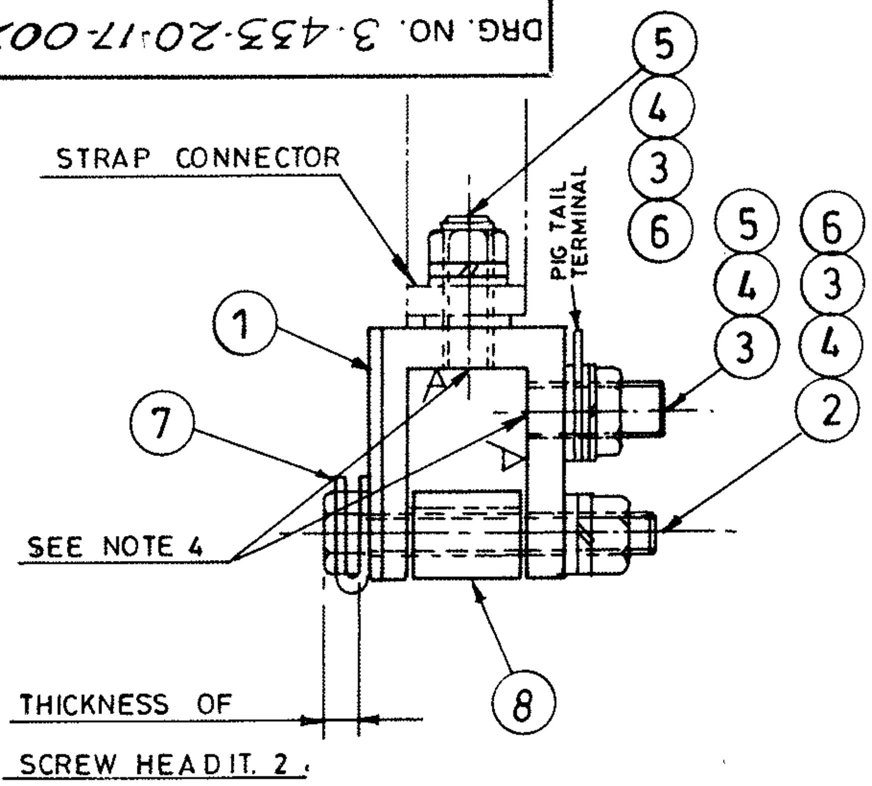
REV	DATE	ALTERED / CHECKED / APPROVED	INVENTORY No.
06	06.8.15	ALTERED / CHECKED / APPROVED	IN TOOL LIST, TOOL NO. 1402932 DELETED. (TCM–346)
05	10.2.14	ALTERED / CHECKED / APPROVED	DIM 22.28/22.35 WAS 22.22/22.35 SPEC. OF IT 005 AA7121123 WAS AA10112.
04	26.2.09	ALTERED MMJ / CHECKED OPV / APPROVED APS	DRG. UPDATED & DIGITIZED. STYLE LIST ADDED.

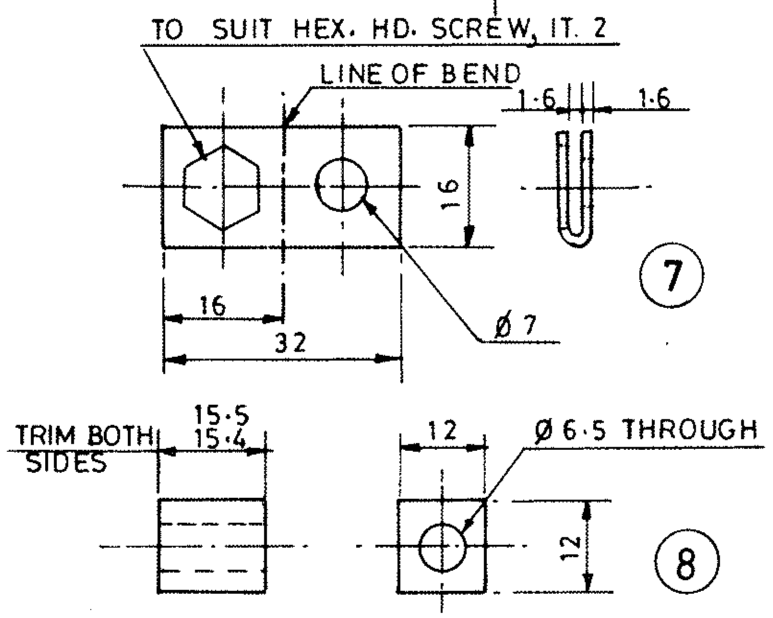
SIGN. & DATE | REF. DRG. NO. D4775791

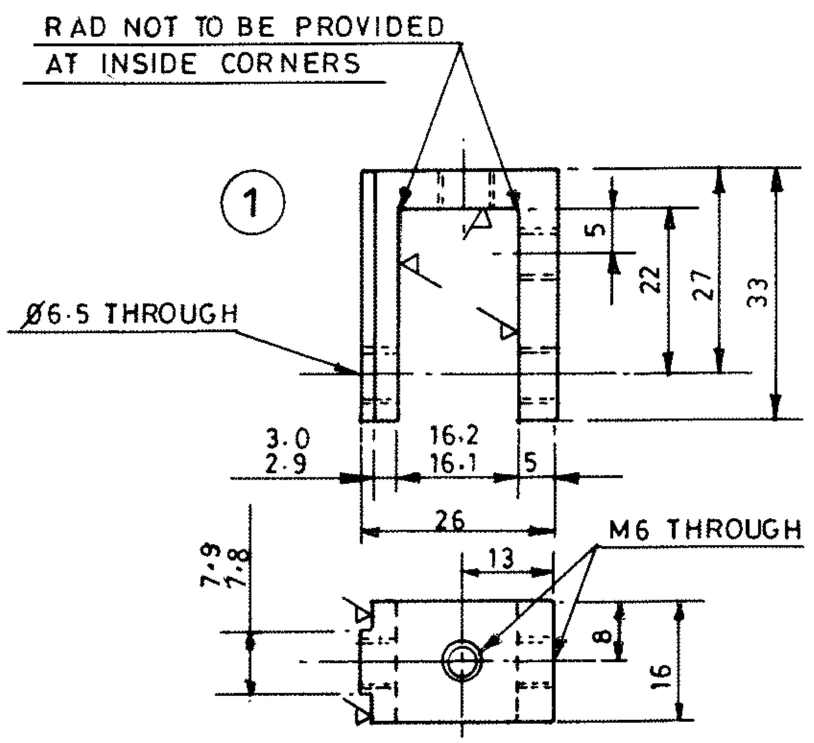
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 3-433-20-17-002







TOOL LIST		
ITEM	TOOL	DESCRIPTION
001	145978	16·1 / 16·2 SQ. CHECKING GAUGE

NOTE :—

1. ITS. 2,4 TO 8 TO BE ZINC PLATED TO AA 0673603 AND PASSIVATAD TO AA 0673604, WITH A PLATING THICKNESS OF 0·013 TO 0·015 MM.
2. CLAMP TO VAR.00 TO BE BOUGHT-OUT.
3. CLAMP BODY IT.001 TO BE SUPPLIED WITH PLATING THICKNESS OF 0·013 TO 0·015MM ELECTROPLATING OF THIS TO AA 0673602.
4. BRAZE SCREW IT. 005 WITH IT. 001 AND FLUSH TO MACHINED SURFACE AS SHOWN.
5. IT. 003 TO BE PARKARISED TO PRS. AA 0673616.
6. TOLERANCE FOR ALL UNTOLERATED DIMS. ±0·1 MM

VAR.00	REMARKS	VAR. NO.	ITEM NO.	DESCRIPTION	STD.	DRAWING NO.	IT.NO. / VAR	MATL. CODE / MATL SPCN.	UNIT	UNIT WT. / QTY.	GS
001			008	DISTANCE PIECE 12 SQ.×16	1			AA 10112	NA KG MM	0·014	
001			007	LOCKING PLATE 1·6 THK X 16×32	1			AA 10115	NA KG MM	0·005	
002			006	HEX NUT M6-P4					NA KG MM	0·003	
002			005	SCREW AM6-4·6×20 ST.	1			AA 10112	NA KG MM	0·003	
005	SEE NOTE-2		004	PUNCHED WASHER B 6·6 S					NA KG MM	0·001	
003			003	SPRING WASHER B-6					NA KG MM	0·001	
001			002	HEX. HD SCREW M6-P4·6×40					NA KG MM	0·010	
001			001	CLAMP BODY (BRASS) 16TK.X26X33 HALF HARD	1			AA 12114	NA KG MM	0.044	

28 → CARD TYPE - 3   28 → CARD TYPE - 1   28 → CARD TYPE - 2

ADDITIONAL INFORMATION
SIMILAR COMPT. DRG. E 4700844/1
STATUS OF DRAWING

DISTRIBUTION OF PRINTS
O.C. - 1 TNX - 1
TAM - 4

उत्पाद का प्रकार या ग्राहक/परियोजना का नाम
TYPE OF PRODUCT OR NAME OF CUSTOMER / PROJECT: AG 51/M, AG 2513 AZ/M, AG 2501 AZ/M

भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD. BHOPAL

	नाम / NAME	हस्ता. / SIGN	दि. / DATE
बनाया DRN.	AGB.	Sd.	24-8-88
जांचा CKD.	SMA.	Sd.	25-8-88
स्वीकृत APPD.	RAD.	Sd.	15-9-88

वेरि.की संख्या NO.OF VAR.: 00

REV.	DATE	ALTERED / CHECKED / APPROVED
06	3-10-97	(signed)

ZONE: DRG. RETRACED, TOOL LIST WAS NOT ON.

विभाग DEPT.: TME
कोड CODE: 405
अन. टाल. नाप की श्रेणी UNTOL. DIMS. GR.
अनुपात SCALE: 1:1
भार (कि.ग्रा.) WEIGHT (K.G.): 0·093
अस. ड्राइंग का संदर्भ REF. TO ASSY. DRG.: 0 433 20 17 001
मद. क ITEM NO.: 002
मद.संख्या NO.OF ITEM: 008

शीर्षक / TITLE: BRUSH HOLDER CLAMP

ड्राइंग क्र. / DRAWING NO.: 3-433-20-17-002

पुन./REV.: 06

पृष्ठ क्र. / SHT. NO. 01   पृष्ठों की सं. / NO. OF SHT. 01

TCM-252

REF. DRG. NO. | SIGN & DATE | INVENTORY NO.

A3 SIZE

P.O. No. 3756063

	CORPORATE PURCHASING SPECIFICATION	AA10112
		Rev No. 07
		PAGE 1 of 4

BRIGHT STEEL BARS AND SECTIONS (STANDARD QUALITY)

1 GENERAL:

This specification governs the quality requirements of Bright Steel Bars and Sections of standard quality, such as I-beams and equal angles required in very small sections.

2 APPLICATION:

Bars are used in the manufacture of threaded and machined components for general engineering purposes. Sections are used as stator spacer plate vents in generators.

3 CONDITION OF DELIVERY:

3.1 Round Bars - Class 4, surface quality.

Up to 50 mm diameter - Cold drawn.

Above 50mm diameter - Cold drawn or Hot rolled, turned and polished

3.2 Rectangular/Square/Hexagonal Bars - Class 3, surface quality.

All sizes - Cold drawn.

3.3 Sections - Class 4, surface quality.

All sizes - Cold drawn

3.4 Bars and sections shall be straight, with their ends sheared, square and true and shall have a smooth surface.

3.5 The bars and sections shall be given a clear temporary rust preventive (TRP) coating to avoid corrosion during transit and storage.

Black TRP coating is not acceptable.

Clear TRP used shall be free from pungent smell.

The following clear TRP's are suggested:

a) Servo RP 150 - M/s Indian Oil Corporation

b) HE - 1612 - M/s. BHEL, Bhopal

c) Rustilo DW-901 - M/s. Indrol Lubricants and Specialties Ltd.

d) Rustpro Special - M/s. Tide water oil co.

e) Any other clear TRP conforming to IS: 1154

4 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall comply with the requirements of the following National standards and also meet the requirements of this specification.

IS: 9550-2001 : Bright steel bars

Revisions: Cl 27.2.d of MOM of MRC-S&GPS			**APPROVED**: INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(S&GPS)		
Rev No.07	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue
Dt:15-06-2005	Dt:	Year:2019	HEP, Bhopal	Corp.R&D	September 1976

5 DIMENSIONS AND TOLERANCES:

5.1 Sizes:

Bars shall be supplied to the dimensions specified in BHEL order.

5.2 Tolerances:

5.2.1 Rectangular/Square/Hexagonal/Flat Bars:

Unless otherwise specified, tolerances on dimensions shall be as follows:

For drawn round bars and turned bars h10 to table 2 of IS:9550

For hexagonal and square drawn bars upto and including 80mm h11 and above 80mm h12 according to table 2 of IS:9550

For drawn flats in accordance with table 3 and 4 of IS:9550

For ground products in accordance with table 1 and 2 of IS:9550

5.2.2 Sections:

As specified in BHEL order/drawing.

5.3 Length:

Bar and sections shall be supplied in lengths of 2.5 to 4.5 meters with maximum 10% of shorts of not less than 1.5 meters.

5.4 Straightness:

Unless otherwise agreed to, the permissible deviation shall not exceed 1.5mm in any one meter length. Bars and sections shall be free from twists and bends.

6 MATERIAL:

The rolled bars used for purpose of producing the bright bars shall be such, so as to ensure freedom from segregation, piping and other harmful defects.

7 MANUFACTURE:

Steel shall be manufactured by the open-hearth, electric, basic oxygen or a combination of these processes.

8 FREEDOM FROM DEFECTS:

All finished steel bars and section shall be sound and free from internal and surface defects. They shall be bright and clean.

9 SURFACE CONDITION:

9.1 Round Bars and Sections:

Shall be entirely free from cracks and other surface defects.

9.2 Rectangular/Square/Hexagonal Bar-Type '3' Finish:

Shall comply with IS: 9550, Class 3 of table 5.

10 CHEMICAL COMPOSITION:

The melt analysis of steel and the permissible variation in the composition of the material form the melt analysis shall be as follows:

Element	Melt analysis percent, max	Permissible variation percent
Carbon	0.25	± 0.02
Sulphur	0.040	+ 0.005
Phosphorus	0.040	+ 0.005

11 TEST SAMPLES:

One sample for chemical and tensile test shall be selected from finished steel for every 20,000 kg or part thereof, with a minimum one per heat.

12 MECHANICAL PROPERTIES:

When tested in accordance with IS:1608, the test pieces shall show the following properties:

12.1 Rectangular/Square/Hexagonal/Section - Cold Drawn:

Tensile Strength : 440 N/mm^2, min

Elongation on $5.65\sqrt{S_o}$ gauge length : 8 – 20%

12.2 Round Bars:

12.2.1 Bars upto 50mm Diameter – Cold Drawn

Tensile Strength : 440 N/mm^2, min

Elongation on $5.65\sqrt{S_o}$ gauge length : 8 – 20%

12.2.2 Bars above 50mm Diameter:

Cold drawn or hot rolled, turned and polished.

Property		Hot rolled, turned and polished		Cold drawn
Tensile strength, min.	:	410 N/mm^2	OR	440 N/mm^2
Elongation on $5.65\sqrt{S_o}$ gauge length	:	23%, min		8-20%

13 TEST CERTIFICATES:

Three copies of test certificates shall be supplied, unless otherwise stated on the order.

In addition, to the above, the supplier shall ensure to enclose one copy of the test certificate along with their despatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

AA10112; Rev. No. 07 :
BHEL order No,
Supplier's Reference:
Name
Identification No.
Melt No.
Results of Tests:
Dimensional inspection.
Results of Chemical analysis and mechanical tests.

14 PACKING AND MARKING

The material shall be suitably packed in bundles – polythene wrapped to prevent sagging, corrosion and damage during transit. A suitable clear temporary rust preventive shall be applied all the bars as per clause 3.5 above and finally dispatched in wooden boxes.

Each bar over 50mm shall be stamped at one end with 'AA10112'. Bars 50mm and below shall be bundle together and tied with wire at 3 to 4 places along the length of the bar.

A metal label shall be securely attached to each bundle and shall bear the following information:

AA10112: BRIGHT STEEL BARS AND SECTIONS (STANDARD QUALITY)
BHEL Order No.
Consignment/Identification No.
Melt No.
Size and Weight.
Supplier's Name.

15 REFERRED STANDARDS (Latest Publications Including Amendments):

1) IS: 1154 2) IS: 1608 3) IS: 9550

Technical Pre-Qualification Requirement (PQR) for procurement of Brush Holder Clamp

Ref. No. TME/AG BHClamp **Date: 12.07.25**

Sl. No.	Description	Vendor to provide Supporting relevant document /Comments	
		Complied / Not complied	Supporting relevant document to be submitted
1.	Offered item should be exactly as per drawing and specification mentioned in tender enquiry/ NIT.	Yes/No	Deviation if not accepted
2	Supply experience in preceding 5 years (from tender opening date) of same/similar * item to rotating traction machine manufacturer or Indian Railways.	Yes/No	Un-price PO copies & corresponding proof of supply (delivery challan / invoice etc.)

Note:

1) ***Brass based brush holder & brass base holding clamp shall be considered as same or similar item.**
2) **Compliance of above PQR is mandatory. In absence of compliance of above, vendor's offer is liable to be rejected.**

Prepared By:	Approved by:
	
Shishu Pal Sr.Mgr./TME	V. Rawtiya Sr.DGM./ TME

	CORPORATE PURCHASING SPECIFICATION	**AA 101 15**
		Rev. No. 09
		PREFACE SHEET

COLD ROLLED CARBON STEEL SHEET, ANNEALED-DRAWING

FOR INTERNAL USE ONLY
REMOVE THIS PREFACE SHEET BEFORE ISSUE TO SUPPLIERS

Comparable Standards:

1.	INDIAN	:	IS: 513-1994 Gr: D (Drawing) Quality : Killed/Semi Killed Temper : SP-Annealed, skin passed Surface finish : Matt (Medium or dull) Surface type : Best
2.	GERMAN	:	DIN 1623-1983, Part 1, Gr: RRSt-13.03, Surface finish 'm'

Suggested/Probable Suppliers And Grades:

1.	M/s SAIL	:	IS : 513, Gr:D, Killed/Semi Killed. Temper : SP-annealed & Skin passed, Matt (Medium or dull finish) Best surface

User Plant References:

1. BHOPAL	:	BP 101 15
2. HEEP, HARDWAR	:	0500.003
3. HYDERABAD	:	HY 021 02 99
4. TIRUCHY	:	BM-CQ 10-Part 1

Revisions : **Cl: 27.6.8 of MOM of MRC-S&GPS**			**APPROVED :** **INTERPLANT MATERIAL RATIONALISATION COMMITTEE-MRC (S&GPS)**		
Rev. No. 09	**Amd.No.**	**Reaffirmed**	**Prepared**	**Issued**	**Dt. of 1st Issue**
Dt:15.06.2005	**Dt :**	**Year :**	**BHOPAL**	**Corp. R&D**	**JULY, 1976**

	CORPORATE PURCHASING SPECIFICATION	AA 101 15
		Rev. No. 09
		PAGE 1 OF 7

COLD ROLLED CARBON STEEL SHEET, ANNEALED - DRAWING

1.0 GENERAL:

This specification governs the quality requirements of Cold Rolled Carbon Steel Sheet/Coil of drawing quality, Annealed and skin passed condition. Sheets having thickness of 0.40 to 3.15 mm (both inclusive) and widths upto 1250 mm are covered in this specification.

2.0 APPLICATION:

Suitable for Drawing/ Welding..

3.0 CONDITION OF DELIVERY:

Sheets/Coils : 0.40 mm to 3.15 mm thick, cold rolled, descaled and oiled sheet/coil shall be supplied in fully annealed and skin passed condition. The size, weight and packing of the coils/sheets shall be as agreed to between the manufacturer and BHEL for indigenous material. For imported material, it shall comply with clause 14.0.

Sheets shall be supplied in straight lengths or in coils as specified in BHEL order.

Sheets shall be flat and the edges cleanly sheared and truly squared to the specified dimensions.

Oils used for rust prevention shall be free from pungent smell. The following oils are suggested :

a) SERVO RP 125 of M/s. IOC.

b) RUSTOP 387/388 of M/s. HPC

c) Bharat TCPF of M/s. Bharat Petroleum

d) Any other TRP conforming to IS : 1154

Sheets shall have a matt surface finish and best surface appearance.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

4.1 Material shall comply with the requirements of IS:513-1994,
Gr:D-Drawing, Temper: SP-Annealed & Skin passed;
Quality; killed/semi killed; Surface type - Best;
Surface finish : Matt.

Revisions : Cl. 27.6.8 OF MOM OF MRC-S&GPS			APPROVED : INTERPLANT MATERIAL RATIONALISATION COMMITTEE-MRC (S&GPS)		
Rev. No. 09	Amd.No.	Reaffirmed	Prepared BHOPAL	Issued Corp. R&D	Dt. of 1st Issue JULY, 1976
Dt: 15.06.2005	Dt :	Year :			

4.2 Material offered to DIN 1623-1983, Part 1, Gr : RRSt-13.03, (Material No. 1.0347) Surface appearance: Best surface - 05, Surface finish : Matt 'm', is also acceptable.

4.3 The tolerance on dimensions shall comply with DIN : 1541.

5.0 DIMENSIONS AND TOLERANCES:

5.1 Sizes:

Cold rolled carbon steel sheets/coils shall be supplied to the dimensions specified in BHEL order.

5.2 Tolerances:

The tolerances on sheets and coils shall comply with IS : 513 as detailed below:

5.2.1 Thickness:

Tolerances on thickness of sheets

Nominal thickness, mm	Tolerance for nominal widths upto 1250 mm
-- 0.40	± 0.04
Above 0.40 up to 0.60	± 0.05
Above 0.60 up to 0.80	± 0.06
Above 0.80 up to 1.00	± 0.08
Above 1.00 up to 1.25	± 0.09
Above 1.25 up to 1.60	± 0.11
Above 1.60 up to 2.00	± 0.12
Above 2.00 up to 2.50	± 0.14
Above 2.50 up to 3.15	± 0.16

5.2.2 Width:

Width	Tolerance
Upto & Incl. 1250 mm	+ 7 mm - 0
Above 1250 mm	+ 10 mm - 0

5.2.3 Length:

Up to and incld. 2000 mm	+ 15 mm - 0
Over 2000 mm	+ 0.75 percent of length - 0

5.2.4 Camber:

Camber is the greatest deviation of a side edge from a straight line, the measurement being taken on the concave side with a straight line. Camber tolerances are as specified below:

Coils - 20 mm in any 5000 mm length

Cut lengths - 0.4% x length.

5.2.5 Out-of Square Tolerance (for cut lengths) :

1 percent of the width.

(Out-of squareness is the greatest deviation of an edge from a straight line drawn at a right-angle to the other edge of the sheet, touching one corner and extending to the opposite edge).

6.0 MANUFACTURE :

Steel shall be manufactured by open-hearth, electric, basic oxygen or a combination of these processes.

Material shall be manufactured from semi killed/killed steel, preferably aluminum killed.

Rimmed steel is not acceptable.

7.0 FINISH:

Material shall have a medium or dull finish. Pores, roll marks or scratches which do not impair uniform appearance of the finished product are permissible. The sheets shall be free from waviness and the surface shall be ideal for spray painting.

8.0 HEAT TREATMENT :

Sheets and coils shall be fully annealed and skin passed.

9.0 FREEDOM FROM DEFECTS :

The material shall be free from harmful defects such as scale, rust, blisters, laminations, pitting, cracked edges, etc.

10.0 CHEMICAL COMPOSITION :

The melt analysis of steel and the permissible variation in the composition of the material from the melt analysis shall be as follows:

Element	Melt analysis, percent, max.	Permissible variation percent, max.
Carbon	0.12	0.02
Manganese	0.50	0.03
Sulphur	0.040	0.005
Phosphorus	0.040	0.005

11.0 TEST SAMPLES:

One bend test and hardness test shall be carried out from each lot of 5,000 kg of material or part thereof, per melt per consignment.

Where material of more than one thickness are rolled from the same melt, one additional bend test shall be made for each thickness.

Test pieces shall be cut so that the axis of the bend is parallel to the direction of rolling, viz., transverse direction.

12.0 MECHANICAL PROPERTIES :

12.1 Bend Test :

The test piece shall be capable of being bent cold through 180^0 close without showing sign of cracks or fracture on the outer convex surface.

Bend test shall be carried out in accordance with IS : 1599.

12.2 Hardness (VICKERS) :

When tested as per IS : 1501, the test pieces shall show a Vickers hardness as given below:

Upto & Incl. 1.25 mm, thick	:	115 HV, max.
Above 1.25 mm, thick	:	125 HV, max.

13.0 TEST CERTIFICATES:

Unless otherwise specified, three copies of test certificates shall be supplied.

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

The test certificate shall bear the following information:

AA 101 15, Rev 09/IS:513 Gr:D/DIN 1623 Gr: RRSt 13.03 m,

BHEL Order No,

Melt No,

Size and Quantity,

Results of Chemical analysis and Mechanical tests,

Supplier's name,

Identification No

TC No,

Signature of Competent authority, etc..

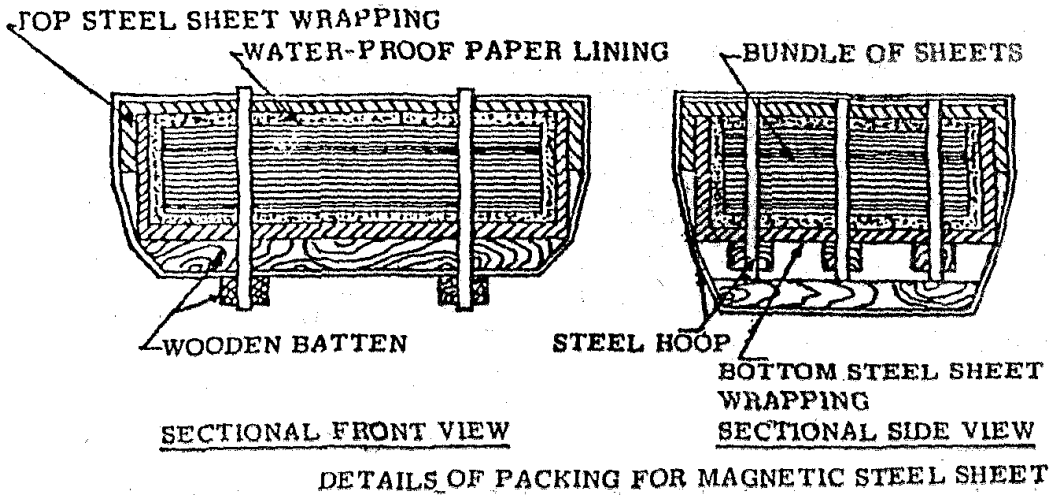
14.0 PACKING :

14.1 Packing:

Sheets and Coils shall be suitably packed in bundles to prevent corrosion and damage during transit.

Recommended packing for imported material shall be as shown below. However, other methods of packing is also acceptable if prior agreement of BHEL is obtained in writing by the manufacturer.

14.2 **Sheets :**



DETAILS OF PACKING FOR MAGNETIC STEEL SHEET

Note:

a) Water proof paper lining shall be preferably Volatile Corrosion Inhibitor (V.C.I.) Coated Paper with an additional polythene (100 micron) enveloped.

b) Approximate weight of each bundle shall be 2 to 3 tonnes. Bundle weighing 2 metric tonnes is however preferred.

14.3 **Coils:**

The material shall be supplied in coils of continuous strip. The nominal weight of each coil shall be 1800 - 2000 kg.

The nominal internal diameter of coil shall be 500 mm.

Sheet shall be protected to prevent damage and rusting during transit.

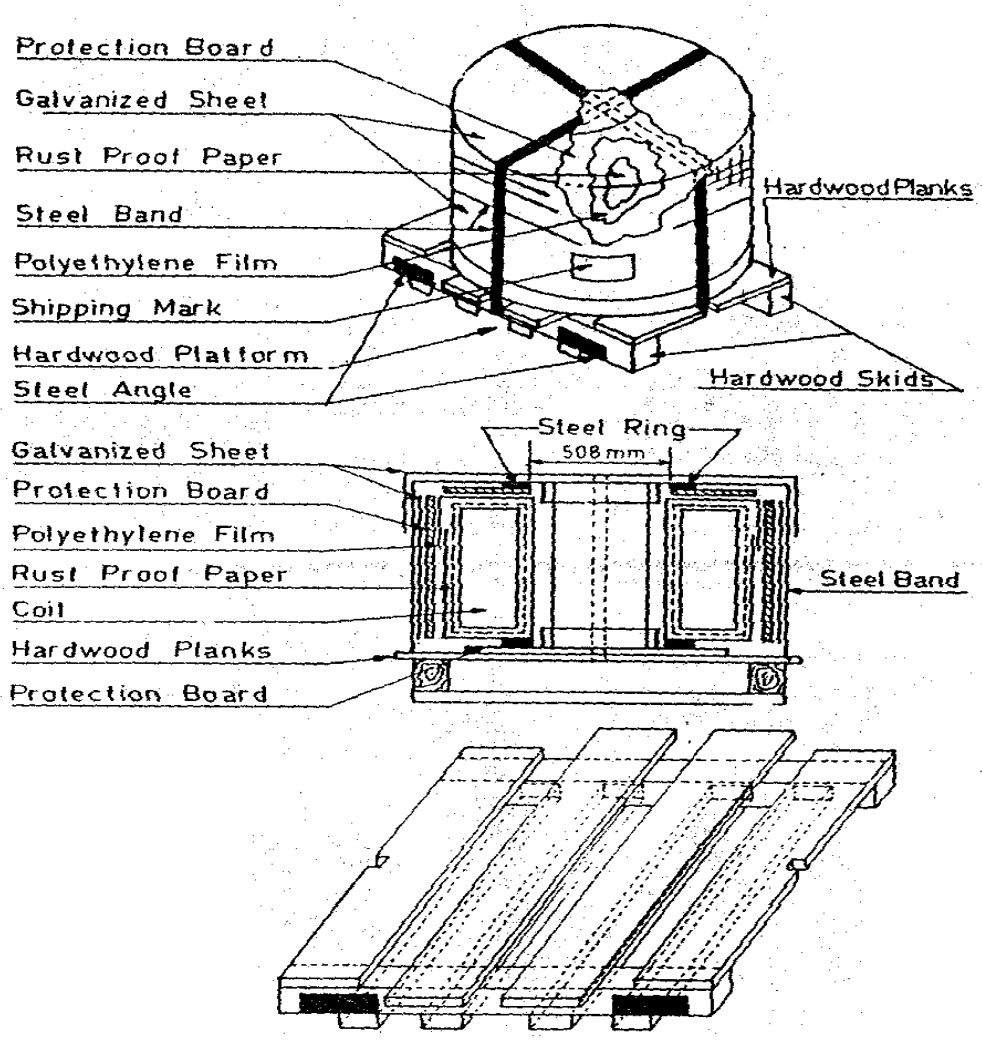
Sheet shall be vertically packed according to the instructions and drawings given below:

a) An annular protection board shall be placed at either end of the coil.

b) The coil should then be wrapped with waterproof anti-rust proof paper by lapping axially all around the circumference.

c) The coil shall then be covered by polythylene sheet or anti-rust waterproof paper and the ends sealed properly.

d) A galvanized sheet shall be wrapped on the outside of the coil and the top and bottom of the coils. Care shall be taken to ensure that the ends of the top and bottom of the coils extend sufficiently over the inside diameter of the coil.



e) A galvanized sheet shall be wrapped on the inside of the coil. Care shall be taken that it overlaps sufficiently over the ends of the sheet mentioned in (d) above.

f) Steel ring made from thick angle sheets shall be placed on the rim of the inner diameter at both ends of the coil. The rings shall be held at either ends at four points by steel bands.

g) The coil should then be mounted on wooden skids held together by steel bands. Wooden skids must have cutouts to house the steel bands for tight fit and to avoid slippage.

h) The packing shall ensure that there is no seepage of moisture and the coils reach BHEL in completely rust free condition. It shall be strong enough to withstand handling.

i) Coils shall be sufficiently tight-wound to prevent collapse to an extent that would preclude their being mounted on a mandrel appropriate to the ordered internal diameter.

j) Each package should indicate the , Sling Position, for lifting without damage. It is preferable to fix a suitable size of, 'Sheet Steel Angle', at the position where the Sling Rope is to be fitted to avoid slippage/damage/breakage of the wooden skid at four places.

15.0 MARKING:

A metal label shall be securely attached to each bundle and shall bear the following information :

AA 101 15
BHEL Order No,
Supplier's Name and Identification No,
Melt No,
Size and Weight.

16.0 REFERRED STANDARDS (Latest Publications Including Amendments) :

1. IS : 513	2. IS : 1154	3. IS : 1501
4. IS : 1599	5. DIN : 1541	6. DIN : 1623, Part 1

GENERAL INFORMATION FOR CALCULATION
(NOT TO FORM ACCEPTANCE CRITERION)

Tensile strength	:	270 - 410 N/mm^2
Yield strength	:	280 N/mm^2, max.
Elongation on 5.65 √So gauge length	:	23 percent, min.

PROCESS FOR ELECTROPLATING TIN FROM ALKALINE BATH ON FERROUS AND NON-FERROUS METAL PARTS

1 GENERAL

This standard details the process for Tin plating by Vat and Barrel process from an alkaline tin solution on articles of steel, copper and copper alloys to protect them against corrosion, to provide surface for soldering of electrical contacts & terminals and for masking during nitriding. Barrel process for smaller components and tank process for larger components shall be followed.

2 APPLICATION

Used for bus-bar connections, spout connections, cable sockets, etc., of switchgear; hardware like nuts, bolts, connection cams of transformer; brush holder, cable glands, etc., of traction motors; clamp plates, support plates, etc., of capacitors; clamps, brackets, etc., of electronics.

3 COMPLIANCE WITH NATIONAL STANDARDS

This Standard has reference to IS 1359 : 1992: Electroplated coating Tin-Specification.

4 MATERIALS

Materials	Available from
Satin Tin Salt-721	M/S Platewel Processes & Chemicals Ltd., Baroda
Satin Tin Salt	M/S Grauer & Weil (I) Ltd., Mumbai
Mutton Tallow (Optional)	Having acid neutralization value of 2.3 to 6.6 mg of KOH/g of mutton tallow
Sodium Perborate	IS 3598
Hydrogen Peroxide -20 volume	
Caustic Soda	AA54201
Tin Anodes	IS 2384
Sodium Stannate	IS 3026

5 EQUIPMENT

5.1 Plating Tank / Vat

The Tank/vat shall be made of mild steel. The vat shall be provided with an insulated frame on top fitted with insulators for holding the anode and cathode rods. The solution shall be heated by steam, gas or electrical heater.

5.2 Barrel

The plating barrel shall be constructed of hard rubber, polypropylene, etc., and shall be so driven as to rotate at 10 to 15 rpm.

5.3 Cold Water Rinsing Tank

Mild steel tank.

5.4 Hot Water Rinsing Tank

Mild steel tank with heating arrangements.

6 COMPOSITION OF ELECTROLYTE AND OPERATING INSTRUCTIONS

6.1 Electrolyte (Bath Solution) And Operating Conditions

The electrolyte shall be of the following compositions and operating conditions as specified below:

	SATIN TIN SALT-721	SATIN TIN SALT
Salt for Vat Plating	150 g/l	110 g/l
Salt for Barrel Plating	250 g/l	200 g/l
Temperature	60 - 70°C	60 - 80°C
Ratio of Anode to Cathode Area (Approximately)	1:1	1:1
Current density (for information only and not a controlling parameter)	1.5-2 A/dm^2 (15-20 A/sq.ft)	1.5-2 A/dm^2 (15-20 sq/ft)
Voltage for Vat	2-6 V	2-6 V
Voltage for Barrel	10±2 V	10±2 V

6.2 Preparation of Electrolyte

The vat/barrel shall be filled with water to about 2/3rd capacity and then heated to nearly 50°C.

The required amount of tin salt shall be added to the water in small quantities with stirring.

After complete dissolution, the electrolyte shall be brought upto the working level by adding water and subsequently stirred thoroughly and heated to the operating temperature.

6.3 Analysis of the Electrolyte

The electrolyte shall be analysed after initial make-up and subsequently at suitable intervals.

The concentration of the electrolyte shall be maintained at the following limits:

Tin (Metal) For vat plating : 30 - 40 g/litre

For barrel plating : 50 - 60 g/litre

Free Caustic Soda (NaOH) For vat plating : 8 - 16 g/litre

For barrel plating : 20 - 30 g/litre

6.4 Temperature and voltage shall be recorded during plating.

7 PROCESS OF PLATING

7.1 Cleaning

All articles shall be properly cleaned as described in BHEL Standard AA0673601:

Process for cleaning and preparation of metal surfaces prior to electroplating, except passivation. If required electrolytic cleaning can also be carried out additionally.

7.2 Rinsing

All articles shall be rinsed thoroughly after cleaning to avoid contamination of the plating solution.

7.3 Pre-heating (Optional)

Before dipping in the plating bath all articles should be dipped in a hot water (80-90°C) bath for pre-heating purpose.

7.4 Plating

All articles shall be plated at the specified current density for a duration which will depend on the thickness of the deposit required.

Note: It shall be ensured that the anodes are never put in the solution before the vat/barrel is loaded and the current switched on. Likewise the anodes shall be removed before switching off the current after the plating is done.

7.5 Cold Rinsing

After removal from the plating bath, all articles shall be rinsed thoroughly in cold running water till any trace of tin solution is removed.

7.6 Hot Rinsing

Finally, all articles shall be rinsed in clean hot water at 80-90°C and dried.

7.7 Reflowing of Tin Deposit (Optional)

Castings having surface impurities like cavities and blow holes, where removal of entrapped alkaline tin solution is not possible, shall be immersed in a mutton tallow bath maintained at 260±10°C for 2 to 10 seconds. After flow melting, the articles are quenched in a bath containing kerosene oil at the top and water at the bottom. The residual oil from the flow melted surface shall be removed by vapour degreasing or by dipping in trichloroethylene. The thickness range of coating that can be flow melted is 2.5 to 7.5 microns.

8 HEAT TREATMENT

8.1 Stress Relieving Before Plating

Severely cold-worked steels or parts made from steel of tensile strength of 100 kgf/mm^2 or greater which have been ground or subjected to severe machining after tempering, shall normally be stress relieved by maintaining them at 200 ± 10°C, for not less than one hour or, preferably, for 30 minutes at the highest temperature within the limits imposed by the tempering temperature.

8.1.1 Some steels which have been carburized, flame-hardened or induction-hardened and subsequently ground would be impaired by the above treatment and shall instead be stress relieved at 140 ± 10°C for not less than five hours.

8.2 Heat Treatment after Plating (Optional)

8.2.1 Components subjected to critical fatigue or sustained loading stressed in service and made from severely cold-worked steels or from steels exceeding 100 kgf/mm^2 tensile strength shall be heat treated at 185 ± 5°C for not less than two hours.

8.2.2 Where the temperature of heat treatment in 8.2.1 would be harmful, for example, for some surface-hardened parts, a lower temperature for a longer time may be required.

NOTE:

When tin is plated on the article for soft soldering purposes, it may be flow melted at a temperature of 250 to 260°C to overcome difficulties in soldering during long periods of storage.

9 MAINTAINANCE OF ELECTROLYTE

9.1 If the electrolyte is low in tin and caustic soda, then add tin salt according to the requirement

9.2 To increase the tin content without affecting the caustic soda content, and addition of sodium stannate should be made.

9.3 If the bath works sluggishly and the anodes are coated with a thick encrustation, it is an indication that the solution is deficient in free caustic soda. The deficiency shall be corrected by maintaining free caustic soda as per clause 6.3.

9.4 If the deposit is rough, dark spongy, sodium perborate shall be added to the solution at the rate of 0.4 g/l of solution. Alternatively, 20 volume Hydrogen Peroxide to the extent of 1.5 ml/litre of solution may be added.

10 CARE OF ANODES

When working correctly the anodes are covered with a greenish yellow film the continuous maintenance of which is most important.

To obtain this film in the first instance, the vat/barrel shall be loaded with dummy cathodes (e.g. steel sheets). The current switched on and then the tin anodes shall be introduced on the one as each becomes filmed over. This is known as polarisation of anode. The current density necessary for this operation is about twice that normally used for plating. The formation of the film shall be at once apparent by the pale yellow brassy appearance of the anodes and shall also be indicated by a rapid fall in amperage and increase in voltage. As soon as the anodes are properly polarised in this manner, the current shall be reduced to normal and dummy cathodes replaced, one by one, with the articles to be plated. The batch shall be operated continuously for several hours, if possible, removing a number of articles at a time and replacing them with others before further unloading. In this way there will always be sufficient current passing to keep the anodes filmed the whole time they are in the vat/barrel.

At the end of day's work, anodes shall be taken out, current switched off and finally plated articles shall be removed. On commencing work again, the vat/barrel shall be loaded with articles current switched on and then anodes shall be introduced. If for any reason, the anodes lose their greenish yellow surface film and become a normal tin color they must be 'worked in' again as directed at the beginning of this clause until properly filmed over. It is important that the current be kept flowing continuously the whole time the anodes are in the vat/barrel in order to maintain the necessary film upon them. Failure to observe this precaution and keeping the anodes polarised will give rise to the formation of stannite (i.e. stannous tin) in solution and cause the plating to be dark and rough in texture.

11 PRECAUTIONS

Solution shall be kept covered when not in use.

Any chemical that may be necessary to be added shall be dissolved in a part of the original solution before adding it to the vat/barrel. It shall be poured through a filter.

Any metal that may be deposited on any part of the vat/barrel shall be removed

Any article that becomes lodged in any part of the vat / barrel shall be removed.

12 INSPECTION AND QUALITY OF DEPOSIT

12.1 Sampling

A sample from each batch of tank/barrel load shall be tested.

12.2 Condition of Surface

The plated surface shall appear as a smooth and continuous film over the base metal and shall be free from defects such as pits, stains, cracks, blisters, unplated areas and other superficial blemishes visible to the unaided eye. The plated surface shall be matt white and free from nodules.

12.3 Thickness of Deposit

Thickness of deposit shall be as per Appendix A of IS 1359.

12.4 Adhesion Type Test (Cl 9.3, Appendix- C of IS 1359)

The flaking and blistering of the coating shall be taken as evidence of unsatisfactory adhesion.

12.5 Solderability test (Cl 9.5, Appendix-D of IS 1359)

This test shall be carried out whenever specified on BHEL order.

The samples shall be considered solderable, if they show a uniform coating free from discontinuities of breaks visible to the unaided eye.

Samples of tin coating on copper and copper alloys shall be subjected to preliminary artificial ageing treatment as per clause D-3.1.

13 REJECTION

If the samples taken do not comply with clauses 12.2 to 12.5 a further quantity not less than twice the number originally taken shall be subjected to these tests. If any one of these samples also fails, the whole batch shall be rejected.

14 REFRRED STANDARDS (Latest Publications Including Amendments)

1) IS 1359
2) IS 2384
3) IS 3026
4) IS 3598
5) AA54201
6) AA0673601

PROCESS FOR ELECTROPLATING OF ZINC ON STEEL SURFACES FROM CYANIDE BATH

1 GENERAL

This standard details the process for high-speed bright zinc plating on steel surfaces from cyanide zinc solution bath by tank or barrel to provide protection against corrosion and to give a bright attractive finish to the surface.

2 APPLICATION

Used for components like fasteners, nuts, bolts, electronic panels etc. This process is not suitable for plating on cast iron surfaces.

3 COMPLIANCE WITH NATIONAL STANDARDS

This Standard has reference to the following Indian Standards regarding surface condition and quality of deposit.

IS 1340 : 1977 : Code of Practice for chromate conversion coating on Zinc and Cadmium coated articles and zinc base alloys.

IS 1573 : 1986 : Electroplated coatings of Zinc on Iron and Steel.

IS 3203 : 1982: Methods of Testing Local Thickness of Electroplated Coatings.

IS 9844 : 1981: Method of testing of corrosion resistance of Electroplated and Anodized Aluminium coatings by neutral salt spray test.

4 MATERIALS

Material	CPS No,/IS No./Available from
Sodium cyanide for electroplating	AA55610
Caustic Soda (Tech.)	AA54201
Nitric Acid (Tech.)	AA54102
Zinc Anodes (99.98% Purity, Min.) (Grade 1)	IS 2605
Bright Zinc Salts	M/s. Ronuk Industries Ltd. Mumbai
Zinc Brightener Zn-21	
Zinc Brightener Zn-22	
Zinc Purifier	
Zinc Brite 16 Salt	
Zinc Brite 20 Brightener	M/s. Grauer & Weil (I) Ltd., Mumbai
Monicol Purifier	
Zinek Salt - 501	
Super Zinc Brightener – 505	M/s. Platewel Processes & Chemicals Ltd., Vadodara
Supra Zinc Brightener 555	
Zincad Purifier - 503	
Teknobrite CZ 920 Salt	M/s. Artek Surfin Chemicals (P) Ltd., Mumbai

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Teknobrite CZ 920 Brightener Purisol	M/s. Artek Surfin Chemicals (P) Ltd., Mumbai

5 EQUIPMENT

5.1 Plating Tank / Vat

The Tank/vat shall be made of plain welded steel sheets with rubber lining. The vat shall be provided with an insulated frame on top fitted with insulators for holding the anode and cathode rods. The tank shall also be provided with exhaust system.

5.2 Barrel

The plating barrel shall be constructed out of polypropylene perspex and shall be so driven as to rotate at 5 to 12 rpm.

5.3 Rinsing Tanks

Mild steel tank lined with rubber / FRP / PVC.

5.4 Hot Water Rinsing Tank (Optional)

Mild steel tank with rubber / FRP lining and heating arrangements.

6 COMPOSITION OF ELECTROLYTE AND OPERATING INSTRUCTIONS

6.1 Composition of Electrolyte (Bath Solution) and Operating Conditions

The electrolyte shall be prepared according to any one of the following compositions and operated at the conditions specified below:

	Parameter	Composition			
		I RONUK	II G&W	III PLATEWEL	IV ARTEK SURFIN
Sl. No.	Name of salt	Bright Zinc	Zinek. Brite	Zinek 501	Tekno Brite CZ 920
	Salt Content				
	For vat	180-200	200	200	200
	For barrel	200-220	200	200	200
1	Zinc Brightener Zn-21, ml/l	1.5	---	---	---
2	Zinc Brightener Zn-22, ml/l	2.5	---	---	---
3	Super zinc	---	---	6-8	---
	Brightner-505, ml/l	---	---	3-5	---
4	Supra Zinc				
	Brightener 555, ml/l	---	3-5	---	---
5	Zinc Brite 20				
	Brightener, ml/l	---	3-5	---	---
6	Tekno Brite CZ 920 Brightener	---	---	---	2-4
7	Monicol Purifier, ml/l	---	5	---	---
8	Zincad Purifier-503, ml/l	---	---	5	---
9	Purisol, ml/l	---	---	---	4
10	Temperature	Room-55	20-45	25-55	20-45
11	Anode to Cathode Ratio	1:1	1:1	1:1	1:1
12	Current density, A/dm^2				
	a) For vat	1.5-4.5	2-5	2-5	2-5
	b) For barrel	1.5-4.5	0.5-2	0.5-2	0.5-2

13	Voltage, (Volts)				
	a) For vat	6-8	2-6	3-6	2-5
	b) For barrel	12-15	10-15	12-16	10-15

6.2 Preparation of Electrolyte

6.2.1 The vat/barrel shall be filled with water, preferably with demineralised water, to about two-thirds of its capacity.

6.2.2 The required amount of salt shall be added to the bath in small quantities with stirring.

6.2.3 The temperature of the solution should not raise beyond 70°C.

6.2.4 Stirring shall be continued until all the salts get dissolved.

6.2.5 The solution shall then be brought upto the working level by adding cold demineralised water. At this stage the temperature of the bath shall be at the working range.

6.2.6 The requisite amount of purifier shall now be added to the solution and stirred thoroughly. If necessary, filtration at this stage shall be carried out. Then requisite amount of brightener shall be added.

6.3 Analysis of the Electrolyte

The solution shall be analysed initially after make up and subsequently at suitable intervals.

6.4 Maintenance of the Electrolyte

6.4.1 The concentration of the electrolyte shall be maintained as below:

Parameter	Composition			
	I	II	III	IV
	RONUK	G&W	Platewel	ARTEK
Zinc as metal, g/l	33-40	30-40	30-34	30-40
Total Sodium Cyanide, g/l	90-105	75-140	80-90	75-140
Total Sodium Hydroxide, g/l	75-93	65-85	70-80	65-85
Sodium Cyanide to Zinc ratio	2.5-3:1	2.5-3.5:1	2.7-3.2:1	2.5-3.5:1

6.4.2 Addition of Brighteners

Brightness of the deposit shall be maintained by adding brighteners for every 1000 ampere-hours as shown below:

Brightener	Composition			
	I	II	III	IV
	RONUK	G&W	PLATEWEL	ARTEK
Brightener Zn-21, ml	60	---	---	---
Brightener Zn-22, ml	100	---	---	---
Zinc Brite 20 Brightener:				
i) For vat, ml	---	100-150	---	---
ii) For barrel, ml	---	150-200	---	---
Super Zinc Brightner-505:				
i) For vat, ml	---	---	150	---
ii) For barrel, ml	---	---	200	---
Supra Zinc Brightener – 555	---	---	100	---
Teknobrite CZ 920 Brightener	---	---	---	100-250

Brighteners may be added directly into the bath and stirred well. Excess of brightner must be avoided.

6.4.3 Bath shall be analyzed periodically and if the values do not lie in the limits as given in 6.3.1, required chemicals shall be added to the bath to bring the composition to the required level.

6.4.4 Purification of Electrolyte:

The electrolyte shall be filtered at least once in a week or as required addition of 0.25 ml of zinc purifier per litre of solution for Composition-I, 0.1 to 0.2 ml of Monicol per litre for Composition-II and 0.1 to 0.2 ml of Zincad-503 purifier for Composition-III shall be made daily and stirred well to eliminate impurities in the solution and also to settle before resuming the work.

7 PROCESS:

7.1 Cleaning

All articles shall be properly cleaned as described in BHEL Standard AA0673601: Process for cleaning and preparation of metal surfaces prior to electroplating or BP0673693: Electroplating of zinc on steel surface from Acid bath.

7.2 Rinsing

All articles shall be rinsed thoroughly after cleaning to avoid contamination of the plating solution.

7.3 Plating

It shall be ensured that the current is on before the articles are put into barrel or tank.

All articles shall be plated at the specified current density for a duration, which will depend on the thickness of the deposit required.

7.4 Cold Rinsing

After removal from the plating bath, all articles shall be rinsed thoroughly in cold running water till all the traces of solution are removed.

7.5 Drying

The rinsed articles shall be dried using a centrifugal drier or hot air blower /hot air oven.

8 HEAT TREATMENT: (Whenever required)

Note : Steels of tensile strength of 100 kgf/mm^2 or corresponding hardness should be heat treated.

8.1 Stress Relieving Before Plating: (IS 1573)

In accordance with IS 1573.

8.2 Stress Relieving after Plating: (IS 1573)

In accordance with IS 1573.

9 PASSIVATION

Electroplated heat treated articles shall be passivated as per AA0673604 : Process for Passivation of Zinc And Cadmium Plated Articles.

10 CARE OF ANODES

Anodes shall be removed from the bath when the bath is idle.

Ensure that the anodes are bright in luster while plating is on.

11 PRECAUTIONS

11.1 While preparing the solution the operator shall use rubber hand gloves, apron and respirator mask to avoid irritation of skin and suffocation due to fumes. The safety precautions for electroplating shop and handling of chemicals given in AA0462801 shall be followed.

11.2 Solution shall be kept covered when not in use.

11.3 Any chemical that may be necessary to be added shall be dissolved in a part of the original solution (except brighteners) before adding it to the vat/barrel. It shall be poured through a filter or perforated bucket.

11.4 Any metal that may be deposited on any part of the vat/barrel shall be removed immediately.

11.5 Any article that becomes lodged in any part of the vat / barrel shall be removed immediately.

11.6 Remove Zinc Anode at the end of shift so as to avoid dissolution of zinc metal during idle period.

12 INSPECTION AND QUALITY OF DEPOSIT

When tested in accordance with the test methods shown against each, the deposit shall conform to the norms specified below:

12.1 SAMPLING

Minimum of 1% of each batch of tank/barrel load of part there of shall be taken at random for testing with a minimum of 5 samples. When plated components are big and cannot be subjected to any of the specified test, a test panel of suitable size of the same basis metal shall be plated along with component under identical conditions for the purpose of testing. For corrosion resistance tests, test piece of minimum 150 mm. length, and 100 mm width and approximately 1 mm thick shall be used.

12.2 Condition of Surface

The plated surface shall appear as a smooth and continuous film over the basis metal and shall be free from defects such as pits, stains, cracks, blisters, nodules, pinholes, un-plated areas and other superficial blemishes visible to the unaided eye. The plated surface shall be bright with required passivation.

12.3 Thickness of Deposit (IS 3203)

The minimum thickness shall be as specified on relevant drawing on BHEL order.

12.4 Adhesion (IS 1573)

Flaking and blistering of the coating is not acceptable and the coating shall continue to adhere to the base metal after this test.

12.5 Humidity test (IS 1573)

Breakdown of the film or appearance of white corrosion products after two cycles of the test shall be taken as failure.

13 ADDITIONAL TESTS

Whenever required, the following test shall be conducted as per the test methods shown against each and the norms of acceptance shall be as specified below:

13.1 SALT SPRAY TEST (IS 9844)

When tested in accordance with IS 9844 white corrosion products shall not be visible within 96 hours on plated and passivated components.

14 REJECTION

If the samples taken do not comply with clauses 12.2 to 12.5 and 13, a further quantity not less than twice the number originally taken, shall be subjected to these tests. If any one of these samples also fails, the whole batch shall be rejected.

CORPORATE STANDARD

15 REFRRED STANDARDS (Latest Publications Including Amendments)

1) IS 1573
2) IS 2605
3) IS 9844
4) AA54102
5) AA54201
6) AA55610
7) AA0673601
8) AA0673604

	AMENDMENT -NOTIFICATION	AA 067 36 16	Rev. No. 01
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AA 067 36 16: PROCESS FOR MANGANESE PHOSPHATING OF FERROUS SURFACES BY IMMERSION PROCESS

PAGE 1 OF 7; Cl 3.0 COMPLIANCE WITH NATIONAL STANDARDS

Year of IS reference is modified as follows:

IS:3618-66 (Reaffirmed 1997)

Please see Instructions on the reverse.

Ref : Cl; 31.11.19 of MOM of MRC-C	Amd No. 03	Approved MRC- C	Issued CORP. R&D	Date 15.10.2002	Cum.Sr.No. A 3170

	AMENDMENT -NOTIFIFCATION	AA 067 36 16	REV. No. 01
		PAGE 1 OF 1	

AA 067 36 16: PROCESS FOR MANGANESE PHOSPHATING OF FERROUS SURFACES BY IMMERSION PROCESS

1) **PAGE 5.7; Cl 8.3:**
Ferrous ION given in the title is modified as "**ferrous iron**"

2) **PAGE 6.7; Cl 8.3.3:**
Ferrous ION given in the first sentence is modified as "**ferrous iron**"

Please see Instructions on the reverse.

Ref : Cl. No. 28.16.19 of MOM of 28th MRC(C)	Amd No. 02	Approved MRC (C)	Issued CORP. R&D	Date 15.10.2000	Cum.Sr.No. A 2868

	AMENDMENT - NOTIFICATION	AA 067 36 16 Rev. No. 01
		PAGE 1 OF 1

AA 067 36 16 : PROCESS FOR MANGANESE PHOSPHATING OF FERROUS SURFACES BY IMMERSION PROCESS

1.0 Page 3 of 7

Cl. 6.1.3 " 9 Mmersion Time " is replaced by "Immersion Time"

2.0 Page 5 of 7

2.1 Cl. 8.2 The existing matter is replaced by the following:

"The concentration of bath solution shall be regularly checked depending upon the use of bath and maintained as detailed below".

2.2 Cl. 8.3 The title is replaced by the following:

"Ferrous ion concentration maximum 0.5%".

2.2 Cl 8.3.2, "The existing matter is replaced by the following" No. of ml of 0.1 N Potassium Permanganate consumed x 0.056 = Percentage of Ferrous Iron.

3.0 Page 6 of 7

CL. 8.3.3 In the I st sentence "when ferrous ION concentration reaches...." is replaced by the following:

" when ferrous ion concentration reaches...."

Please see Instructions on the reverse.

Ref :	Amd. No.	Approved	Issued	Date	Cum.Sl.No.
Cl 27.4.3 of MOM of MRC (C)	01	MRC (C)	CORP. R&D	15-08-99	A 2587

	CORPORATE STANDARD	AA 0673616
		Rev.No. 01
		PAGE 1 OF 7

PROCESS FOR MANGANESE PHOSPHATING OF FERROUS SURFACES BY IMMERSION PROCESS

1. GENERAL:

This standard details the process for producing a black, non-metallic crystalline, antifriction, coating of manganese - iron phosphate on steel and iron surfaces and its subsequent treatment in oil and varnish.

2. APPLICATION:

This corrosion resistant coating reduces wear on moving parts such as piston, piston rings, gears, liners, bolts, nuts, tools, camshafts, compressor shafts, lubrication boxes, cylinders and all types of machine parts where ever wear is a constant factor to be considered.

3. COMPLIANCE WITH NATIONAL STANDARDS:

This standard has reference to the following national standards in respect of surface condition and quality of deposits.

IS: 3618-1966 (Reaffrimed 1991) : Phosophate treatment of iron and steel for protection against corrosin.

4. MATERIALS:

Material	CPS.No.	IS No.	Avialable From
4.1 Insulating Oil (Low viscosity)	AA 27101	(IS : 335)	
4.2 Chromic Acid	AA 54104	(IS : 330)	
4.3 Rusto-proof pc-19	AA 55608		M/s.Peddington Chemical Industry, Bombay.
4.4 Trichloroethylene (Technical)	AA 56706	(IS : 245)	

Revisions: Cl.26.6.9 MOM of MRC (C)			Approved: INTERPLANT MATERIAL RATIONALISATION COMMITTEE - MRC (C)		
Rev.No. 01	Amd.No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue
Dt. 15-11-97	Dt.	Year:	BHOPAL	CORP. R&D	JAN' 85

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4.5 Sufix MN - 641	: M/s.Grauwer & Weil (I) LTD., Bombay.
4.6 Kemfix Mn 741	: M/s.Artek Surfin Chemicals (P) Ltd. Bombay.
4.7 Black Stain Shellac Varnish	: M/s.C.I.T. BHEL, Bhopal and M/s.Shalimar Paints, Bombay.

5. EQUIPMENT:

5.1 Phosphating Tank:

Mild steel tank preferably lined with hard rubber or propylene and fitted with a water supply, an over flow and a drain system. Thermostatically controlled heating arrangement shall be provided in the tank.

5.2 Chromic Acid Tank:

Mild steel tank preferably lined with hard rubber and fitted with a water supply, an over flow and a drain. Thermostatically controlled heating arrangement must be provided in the tank.

5.3 Rinsing Tank:

Mild steel tank provided with a water supply, an overflow and a drain.

5.4 Air Blowing:

A high pressure of cool air supply may be provided for initial drying.

5.5 Staining Tank:

Mild steel tank fitted with a mild steel lid and a drain cock.

5.6 Oil Tank:

Mild steel tank fitted with a mild steel lid and a drain cock.

5.7 Jigs And Racks:

Jigs, brackets and suspension hooks must be made of mild steel, stainless steel or bakelite.

6. PREPARATION OF BATH SOLUTIONS AND OPERATING CONDITIONS:

6.1 Phosphating Solution:

6.1.1 Rusto-Proof PC 19 : 5% (V/V)

Operating Temperature : 95 to 99 °C.
Immersion Time : 10 to 30 minutes.

6.1.2 Surfix MN-641 : 7% (V/V)

Operating Temperature : 95 to 99 °C.
Immersion Time : 10 to 30 minutes.

6.1.3 Kemfix MN - 741 : 7% (V/V)
Operating Temperature : 95 to 99 °C
9 Mmersion Time : 10 to 30 minutes

6.1.4 The phosphating tank must be thoroughly cleaned before making up the solution.

6.1.5 The clean phosphating tank shall be half filled with clean water and then add the necessary quantity of RUSTO-PROOF PC-19 or SURFIX MN-641 or Kemfix MN 741 to the bath according to the clause 6.1.1, or 6.1.2, or 6.1.3. Bring the solution to working level by adding more water and mix well by stirring and heat to 65 to 70° C.

6.1.5 The bath shall be aged by introducing preferably 50 to 100 gm of cleaned steel wool or scrap iron pieces per 100 litres of bath solution for 30 to 50 minutes. The steel wool shall then be removed and the bath is heated to operating temperature.

6.2 Chromic Acid Solution:

6.2.1 Chromic acid : 0.05% (W/V)
Operating temperature : 85 to 90 °C
Immersion time : 0.5 to 1 minute.

6.3 Black Stain Shellac Varnish:

The varnish shall be supplied ready for use at room temperature.

6.4 Insulating Oil:

The oil shall be supplied ready for use at room temperature.

7. **PROCESS:**

7.1 **Cleaning:**

The articles that are to be phosphated shall be free from oil, grease, rust, scale etc. For manganese phosphating rust and scales shall be preferably removed by shot blasting. In case shot blasting is not possible, cleaning shall be done as per Corporate Standard AA 067 36 01.

7.1.1 All articles shall be placed in a basket or jig or otherwise suitably suspended and the dipped in trichloroethylene for few seconds before immersing it in the phosphating bath.

7.2 **Phosphating:**

All articles shall then be phosphated in the specified operating conditions as mentioned in clause 6.1 and rinsed in clean running water for 15 to 30 seconds.

7.3 **Passivation:**

After rinsing articles shall be dipped in the Chromic Acid passivation solution for 0.5 to 1 minute.

7.4 **Drying:**

The articles shall then be dried at high pressure of cool air supply.

7.5 **Staining:**

Where necessary, after cooling but within two hours of air drying as above, the articles, shall be immersed in black stain shellac varnish for 3 to 5 seconds, removed and allowed to drain and dry in air for atleast 30 minutes.

7.6 **Oiling:**

After staining, the articles shall be immersed in low viscosity insulating oil for 3 to 5 seconds at room temperature. It shall then be removed from oil and allowed to drain.

8. **TESTING & MAINTENANCE :**

8.1 **Testing of Phosphating Solution:**

The solution shall be tested at suitable intervals by the following procedure:

8.1.1 Clean water shall first be added to the solution, if necessary, to restore the latter to the correct working level, followed by stirring to ensure complete mixing.

8.1.2 10 ml. of the working solution shall then be transferred to the 250 ml conical flask. Two or three drops of Alcoholic 1% Phenol-Phthalein indicator must then be added, with shaking.

8.1.3 Sodium Hydroxide 0.10 N shall then be added in with occational shaking or stirring until a permanent colour change (to pink) is just obtained.

8.1.4 The volume of 0.10 N NaOH in ml required shall be noted. The volume in ml is pointage.

8.2 Maintenance Of Solution Strength/Pointage:

The concentration of bath solution shall be regularly checked depending upon the use of bath and maintaince as detailed below.

8.2.1 If the solution is at the correct working strength/pointage the volume obtained in clause 8.1.4 will lie between 30 and 35 ml. for RUSTO-PROOF PC-19 solution and between 40 & 50 for SURFIX MN- 641,and Kemfix MN-741 solution. If the above tests show any deviation from this range, the strength of the solution shall be adjusted as follows:-

8.2.1.1 If the volume is greater than 35 ml. for RUSTO-PROOF PC-19 or greater than 50 ml for SURFIX MN-641 or Kemfix MN-741 sufficient quantity of the solution shall be removed from the tank and replaced by clean water to reduce the volume within the working range.

8.2.1.2 For Rusto-proof PC-19:

If the volume is less than 30 ml., then for each ml.(pointage) below 30, add 2 litres of PC-19 solution per 1000 litres of bath solution.

For Surfix Mn-641 OR KemFix MN-741:

If the volume is less than 40 ml., then for each ml.(pointage) below 40, add 1.75 litre of Surfix -Mn-641 solution per 1000 litres of bath solution.

8.3 Ferrous ION Concentration Maximum 0.5%:

The following procedure shall be followed for testing.

8.3.1 10 ml. of bath solution shal be taken into a 250ml. conical flask, add 1-2 ml. of 50 % H_2SO_4 solution to it. Titrate against 0.1 N Potassium Permanganate till colour changes from colourless to pink, persisting for a least 15 seconds.

8.3.2 No.of ml of 0.1 N Potassium Permanganate consumed X 0.056 = Percentage of Ferrous ION.

CORPORATE STANDARD

8.3.3 When ferrous ION concentration reaches above 0.5% (i.e. consumption of 0.1 N Potassium permanganate is 9 ml.) the phosphate bath should be partially replaced with fresh solution or if required completely discarded.

8.4 Sludge Removal:
The sludge formed during processing shall be removed from the tank and the heating coils after every month. After such cleaning, the solution strength shall be tested as in 8.1 and necessary adjustments made.

8.5 Chromic Acid Solution:
This solution shall be replaced each week.

8.6 Black Stain Shellac Varnish:
The viscosity of varnish at 27° C ± 2 in cup-4 to IS:3944 shall be 30 ± 5 seconds and to be tested each week.

8.7 Insulating Oil (Low Viscosity):
The working level of the oil shall be maintained by periodic addition of new oil.

8.8 Speed of Phosphate Coating:

5 to 7 microns of phosphate coating will be deposited in 30 minutes.

9. INSPECTION AND QUALITY OF DEPOSIT:

When tested in accordance with the test methods shown against each, the deposit shall conform to the norms specified below:

9.1 Sampling:

A minimum of 1% of each batch/load or part thereof shall be taken at random for testings. When the components are big and can not be subjected to any of the specified test, a test panel of suitable size of the same basis metal shall be phosphated along with component under identical condition for the purpose of test (approximate size of test panel 5 cm X 10 cm).

9.2 Freedom from Defects: (IS : 3618)

Phosphated surface shall be of mouse black / dark grey crystalline appearance. They shall be free from untreated patches and from flaky and uneven deposits, some time caused by excessive sludge in the bath. They shall be free from scratches, pits and residues of the processing solution as it may initiate deterioration of the organic coating or premature corrosion.

9.3 Weight of coating: (IS : 3618)

7.5 gm/m^2 minimum.

10. **Referred Standards:** (Latest Publication Including Amendments)

1) AA 27101 2) AA 54104 3) AA 56706 4) AA 55608
5) AA 0673601 6) IS : 330 7) IS : 335 8) IS : 245
9) IS : 3618

SCREWS, HEXAGON HEAD, PRODUCT GRADE 'A' COARSE PITCH, STEEL, PROPERTY CLASS 8.8 (M6 - M24)

1 DESIGNATION

A product Gr. A hexagon head, steel screws of thread M8, length 50mm, coarse pitch and conforming to property class 8.8 shall be designated as:

1.1 On drawings

i) Material specification column: AA7121123

ii) Description column: SCRU HEX A M8X50 - 8.8

1.2 On indents:

Screws Hex A M8 X 50 - 8.8; AA7121123

1.3 For issuing enquiries and on purchase orders:

While issuing enquiries and purchase orders delete BHEL standard number from the above description and add the information given under clause 2.

2 COMPLIANCE WITH STANDARDS

2.1 Dimensions, tolerances and general Requirements

As per IS 1364 : Part 2 : 2018

2.2 Mechanical Properties:

To conform to property class 8.8 as specified in Table - 3 of IS: 1367, Part 3.

Permissible hardness 238-350 HB for sizes M6-M10.

2.3 Threads

Pitch-coarse to IS: 4218, Part 2.

Tolerance quality - Medium.

Tolerance class - 6g.

2.4 Identification Marking:

As stated in clause 10 of IS 1367 : Part 3.

2.5 Surface Discontinuity

As per IS 1367 : Part 9 : Sec 1.

2.6 Finish

Plated as specified in BHEL order

CORPORATE STANDARD

3 NOTE

3.1 Length and diameter combination (refer Table 1 on page 3 of 3) between the bold lines should only be used.

3.2 For screw threads, general (Metric) refer to BHEL standard AA0231800.

3.3 For tolerance grade, position and class refer to BHEL standard AA0230201.

3.4 Screws to this standard would be un-plated; divisions wishing to have plated bolts would have to get them plated.

3.5 Weights given in this standard are for general reference only and are not for commercial transactions.

3.6 When fasteners are to be tested with in BHEL, the sampling and acceptance plan shall be as per IS: 1367, Part 17.

4 REFERRED STANDARDS (Latest publications including amendment)

1) IS: 1364, Part.2
2) IS: 1367 Part.3, 9 : Sec 1 & 17
3) IS: 4218, Part.2
4) AA0230201
5) AA0231800
6) AA0231850

EXPLANATORY NOTE

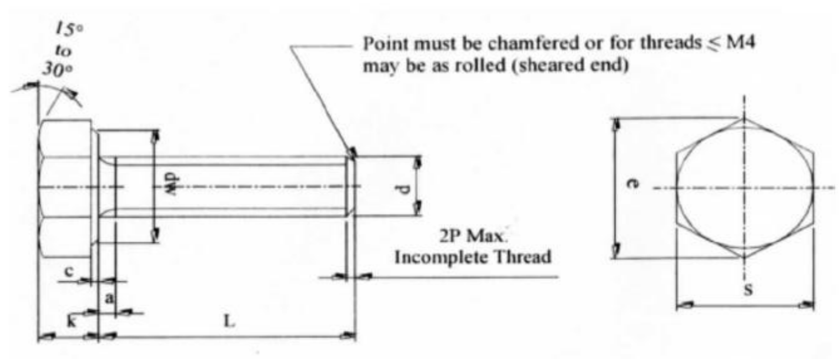
The following changes have been made in the revision:

– In Clause 2.1, year of IS updated to 2018.
– In Clause 2.4, clause 10 in place of clause 9.2.1
– Clause 2.5, updated.

CORPORATE STANDARD

AA7121123

Rev. No. 09



Note:
1. Corporate sub codes are only given in the Table-1
2. For thread runout refer AA0231850
3. Weights have been shown in kg per 1000 No.
4. Sizes beyond chain dotted lines are for Prod Gr. B

Table 1

All dimensions are in mm.

Thread Size d	Head Flats S max	Head Flats S min	Head Crns. e min	Head Thickness k max	Head Thickness k min	Washer Dia. d min	Washer Thickness C max	Washer Thickness C min	Un-threaded length a max	Sub-Code / Weight	Nom. Length (l) 10	12	14	16	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	100	110	120
M6	10	9.78	11.05	4.15	3.85	8.9	0.5	0.15	3	Sub-Code	010	029	037	045	053	061	070	088												See Note-4		
										Weight	4.4	4.75	5.1	5.45	6.25	7.35	8.47	9.58														
M8	13	12.73	14.38	5.45	5.15	11.6	0.6	0.15	4	Sub-Code		096		100	118	126	134	142	150		169		177	185		193						
										Weight		9.96		11.2	12.5	14.3	16.3	18.2	20.2		24.2		28.1	30.1		34						
M10	16	15.73	17.77	6.58	6.22	14.6	0.6	0.15	4.5	Sub-Code				207	215	223	231	240	258	266	274	282	290	304	312				320	339		
										Weight				24.4	23.4	25.9	28.9	32	35.1	38.2	41.2	44.3	47.4	50.5	53.6				65.9	72		
M12	18	17.73	20.03	7.68	7.32	16.6	0.6	0.15	5.3	Sub-Code					347	355	363	371	380	398	401	410	428	436	444	452	460			479		
										Weight					33.7	37	41	45.4	49.9	54.3	58.7	63.6	67.6	72.1	76.5	80.9	85.4			103		
M16	24	23.67	26.75	10.18	9.82	22.5	0.8	0.2	6							487	495	509	517	525	533	541	550	568	576	584	592		606			
																71.7	78.4	85.1	92.2	100	108	115	123	131	139	147	155		171			
M20	30	29.67	33.53	12.72	12.28	28.2	0.8	0.2	7.5																							
M24	36	35.38	39.98	15.21	14.78	33.6	0.8	0.2	9																							

	CORPORATE STANDARD	AA7151131
		Rev. No. 07
		PAGE 1 of 3

NUTS, HEXAGON, PRODUCT Gr.C COARSE PITCH, STEEL, PROPERTY CLASS 4 (M6-M36)

1.0 DESIGNATION

A product Gr.C hexagon, steel nut, thread 20 mm, coarse pitch and conforming to property class 4 shall be designated as

1.1 On drawings

i) Material specification column : AA7151131

ii) Description column : NUT HEX C M20 – 4

1.2 On indents

Nut Hex C M20 – 4; AA7151131

1.3 For issuing enquiries and on purchase orders

While issuing enquiries and purchase orders, delete the BHEL Standard No. from the above description and add the information given under clause 2.0

2.0 COMPLIANCE WITH STANDARDS

2.1 Dimensions, Tolerances and General Requirements

As per IS 1363 : Part 3 : 2018

2.2 Mechanical Properties

To conform property class 4 to Table-5 & 6 of IS: 1367, Part 6

2.3 Threads

Pitch - Coarse to IS: 4218, Part 2

Tolerance quality - Medium

Tolerance class - 7H

2.4 Identification marking

As stated in clause 9 of IS: 1367, Part 6

2.5 Finish

As specified in BHEL order.

Revisions:			APPROVED: INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC (F)		
Rev. No. 07	Amd. No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue
Dt: 22-03-2021	Dt:	Year:	4EDN, Bangalore	Corp. R&D	05-01-1977

CORPORATE STANDARD

3.0 NOTE

3.1 For screw threads, general (Metric) refer to BHEL standard AA0231800

3.2 For tolerance grade, position and class refer to BHEL standard AA0230201

3.3 Nuts to this standard would be unplated, divisions wishing to have plated nuts would have to get them plated.

3.4 Weights given in this standard are for general reference only and are not meant for commercial transactions.

3.5 When fasteners are to be tested with in BHEL, the sampling and acceptance as per IS 1367, Part 17

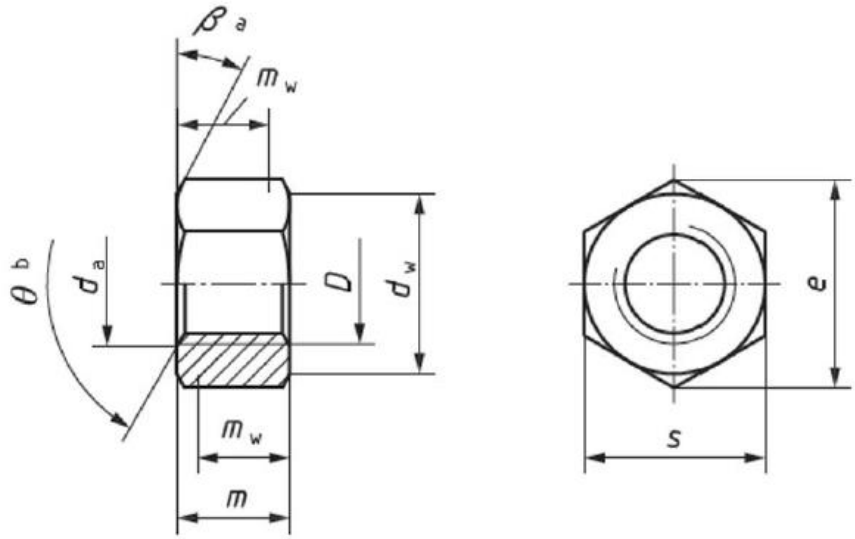
4.0 REFERRED STANDARDS (Latest Publications including Amendment)

1) IS: 1367, Part 6 & 17
2) IS: 4218 Part 2
3) AA0231800
4) AA0230201

EXPLANATORY NOTE

The following changes have been made in the present revision:

- In clause 2.1, year of IS 1363 : Part 3 – 2018 revised.
- Modified Nut drawing as per IS 1363 : 2018 and weight in Table -1.



a $\beta = 15°$ to $30°$.
b $\theta = 90°$ to $120°$.

Table-1

All dimensions are in mm

Thread size d	Flats s		Corners e	Thickness m		Wrenching Height m_w	d_w	Sub-code/ Weight in kg/1000 Nos.
Nom.	Max.	Min.	Min.	Max.	Min.	Min.	Min.	Weight
M6	10	9.64	10.89	6.4	4.9	3.7	8.7	011
								2.35
M8	13	12.57	14.2	7.9	6.4	5.1	11.5	020
								4.81
M10	16	15.57	17.59	9.5	8.0	6.4	14.5	038
								8.81
M12	18	17.57	19.85	12.2	10.4	8.3	16.5	046
								13.26
M16	24	23.16	26.17	15.9	14.1	11.3	22.0	054
								29.58
M20	30	29.16	32.95	19	16.90	13.5	27.7	062
								56.61
M24	36	35	39.55	22.3	20.2	16.2	33.3	070
								95.75
M30	46	45	50.85	26.4	24.3	19.4	42.8	097
								195.33
M36	55	53.8	60.79	31.9	29.4	23.2	51.1	100
								335.37

Note:

1) Corporate sub-code Nos. are only shown in the table.

2) Weights have been shown in kg/1000 Nos.

WASHERS, MACHINED, STEEL

1 DESIGNATION

A machined washer of size 8.4 mm made of steel shall be designated as:

1.1 On drawings

i) Material specification column: AA7161001

ii) Description column: WASHER MCD 8.4-ST

1.2 On indents

Washer Machined 8.4 – Steel: AA7161001

1.3 For issuing enquiries and on purchase orders

While issuing enquiries and purchase orders, delete BHEL standard number from the above description and add the information given under clause 2.

2 COMPLIANCE WITH STANDARDS

2.1 Dimensions, Tolerances and General requirements

As per IS: 2016-1967, Table-1

2.2 Material

Steel as stated in IS: 2016

2.3 Finish

Plated as specified in BHEL order.

3 NOTE

3.1 For machined washers of brass, refer to BHEL standard AA7161002

3.2 For machined washers of copper, refer to BHEL standard AA7161004

3.3 Washers to this standard would be unplated, divisions wishing to have plated washers would have

3.4 For general requirements of washers, refer BHEL standard AA0230408

3.5 Weights given in this standard are for general reference only and are not meant for commercial transactions.

3.6 When fasteners are to be tested with in BHEL, the following sampling and acceptance plan based on IS: 6821 (Table-2) shall be followed for physical properties.

LOT SIZE	SAMPELE SIZE	ACCEPTANCE NOS.
Up to 1000	5	0
1001-3000	8	**0**
3003-10000	13	0
10001-35000	20	0
Over 35000	32	1

CORPORATE STANDARD

4 REFERRED STANDARDS (Latest publications including amendment)

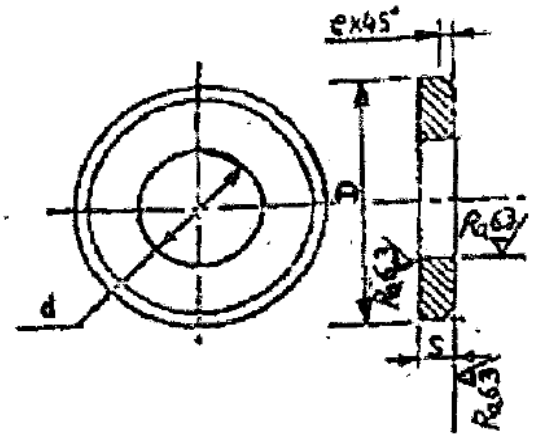
1) IS: 6821
2) AA0230408
3) AA7161002
4) AA7161004

EXPLANATORY NOTE

This standard was first issued in January 1977. The standard was based on IS:2016-1967 for dimensions, tolerances and general requirements. Subsequently many changes have been agreed upon at International & IPSC level and were reflected in IS: 2016-1967.

There is no change in IS: 2016-1967. This standard has been reviewed and brought up to date.

– Clause 3.6 “Sampling plan” for washers has been modified in line with IS: 6821
– Clause 4.0 has been modified accordingly.



Note:

1) Corporate sub codes are shown in Table

2) Weights have been shown in kg per 1000 Nos.

Table 1

All dimensions in mm.

Size Nom. d h12	Outside diameter D		Thickness S		e nom	for bolt or screw size	Sub-code	Weight
	Basic	Tol.	Basic	Tol.				
1.7	4	$^{+0}_{-0.3}$	0.3	±0.1	0.1	M1.6		
2.2	5	$^{+0}_{-0.3}$	0.3	±0.1	0.1	M2	170	
2.7	6.5	$^{+0}_{-0.3}$	0.5	±0.1	0.2	M2.5	161	
3.2	7	$^{+0}_{-0.3}$	0.5	±0.1	0.2	M3	013	0.11
4.3	9	$^{+0}_{-0.3}$	0.8	±0.1	0.3	M4	021	0.29
5.3	10	$^{+0}_{-0.3}$	1	±0.1	0.4	M5	030	0.42
6.4	12.5	$^{+0}_{-0.4}$	1.6	±0.2	0.6	M6	048	1.08
8.4	17	$^{+0}_{-0.4}$	1.6	±0.2	0.6	M8	056	2.07
10.5	21	$^{+0}_{-0.5}$	2	±0.2	0.6	M10	064	3.98
13	24	$^{+0}_{-0.5}$	2.5	±0.3	0.6	M12	072	6.16
17	30	$^{+0}_{-0.5}$	3	±0.3	0.6	M16	080	11.17
21	37	$^{+0}_{-0.8}$	3	±0.3	1	M20	099	16.7
25	44	$^{+0}_{-0.8}$	4	±0.3	1	M24	102	31.78
31	56	$^{+0}_{-1.0}$	4	±0.3	1	M30	110	52.95
37	66	$^{+0}_{-1.0}$	5	±0.6	1.6	M36	129	89.99
43	78	$^{+0}_{-1.0}$	7	±1	1.6	M42	137	180.3
50	92	$^{+0}_{-1.5}$	8	±1	1.6	M48	145	291.26
58	105	$^{+0}_{-1.5}$	9	±1	1.6	M56	188	421.8
66	115	$^{+0}_{-1.5}$	9	±1	2	M64	153	486.45

	CORPORATE STANDARD	AA7164002
		Rev. No. 06
		PAGE 1 of 3

WASHERS, SPRING LOCK, SINGLE COIL, RECTANGULAR SECTION, TYPE-B (WITH FLAT ENDS), STEEL

1.0 DESIGNATION

A single coil, rectangular section, spring lock washer, Type-B (with flat ends) for right hand threads, of nominal size 5 mm, and made of steel shall be designated as

1.1 On Drawings

i) Material specification column - AA7164002

ii) Description column - WASHER SPRING LOCK SC B5 – St

1.2 On Indents

Washer Spring Lock B5; AA7164002

1.3 For issuing enquiries and on purchase orders

While issuing enquiries and purchase orders, delete the BHEL Standard No. from the above description and add the information given under clause 2.0

2.0 COMPLIANCE WITH STANDARDS

2.1 Dimensions, Tolerances and General Requirements

To IS: 3063-1994, Reaffirmed 2010 Type-B (Table – 1A)

2.2 Material

Spring steel Gr.3 to Gr.6, as specified in IS: 4072

2.3 Heat Treatment and Hardness

Spring washer after coiling shall be suitably heat treated, so as to result in the finished washer having hardness in the range of 430-530 HV

2.4 Finish

Unplated.

Revisions: As per clause 32.2 of MOM of MRC-F			APPROVED: INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC (F)		
Rev. No. 06	Amd. No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue
Dt: 06-09-2014	Dt:	Year:	HEP, Hyderabad	Corp. R&D	01-01-1977

CORPORATE STANDARD

3.0 NOTE

3.1 For washers spring lock, Type–A refer BHEL Corporate Standard AA7164001

3.2 Lock washers to this standard would be unplated, divisions wishing to have plated washers would have to get them plated.

3.3 Weights given in this standard are for general reference only and are not meant for commercial transactions.

3.4 When the fasteners are to be tested within BHEL, the following sampling and acceptance plan based on IS: 6821 (Table-1) shall be followed as detailed below for physical properties.

Lot Size	Sample Size	Acceptance No.
Up to 1000	5	0
1001-3000	8	0
3001-10000	13	0
10001-35000	20	0
Over 35000	32	1

4.0 **Referred standards** (Latest Publications including Amendments)

1) IS: 4072
2) AA7164001
3) IS: 6821

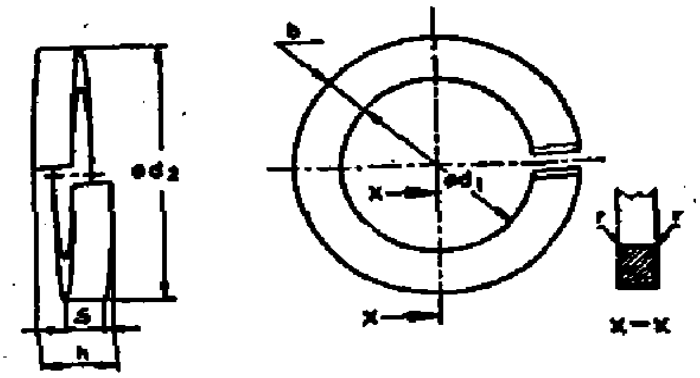


FIG-1

Note:

1) Corporate sub code numbers only are shown in Table-1
2) Weights have been shown in kg per 1000 Nos.

TABLE-1

All dimensions are in 'mm'

Nom size	Internal Dia. d_1		Outside Dia. d_2	Width b		Thickness s		Radius r	For Bolt, Nut or Screw size	Sub-Code	Weight
	Basic	Tol +	Max.	Basic	Tol ±	Basic	Tol ±	Nom.			
2	2.1	0.3	4.4	0.9	0.1	0.5	0.1	0.1	M2		0.033
2.2	2.3	0.3	4.8	1.0	0.1	0.6	0.1	0.1	M2.2		0.050
2.5	2.6	0.3	5.1	1.0	0.1	0.6	0.1	0.1	M2.5		0.053
3.0	3.1	0.3	6.2	1.3	0.1	0.8	0.1	0.2	M3	010	0.11
4.0	4.1	0.3	7.6	1.5	0.1	0.9	0.1	0.2	M4	029	0.18
5.0	5.1	0.3	9.2	1.8	0.1	1.2	0.1	0.2	M5	037	0.36
6.0	6.1	0.4	11.8	2.5	0.15	1.6	0.1	0.3	M6	045	0.83
8.0	8.1	0.4	14.8	3.0	0.15	2.0	0.1	0.5	M8	053	1.60
10.0	10.2	0.5	18.1	3.5	0.2	2.2	0.15	0.5	M10	061	2.53
12.0	12.2	0.5	21.1	4.0	0.2	2.5	0.15	1.0	M12	070	3.82
16.0	16.2	0.8	27.4	5.0	0.2	3.5	0.2	1.0	M16	088	8.91
20.0	20.2	1.0	33.6	6.0	0.2	4.0	0.2	1.0	M20	096	15.2
24.0	24.5	1.0	40.0	7.0	0.25	5.0	0.2	1.6	M24	100	26.2
30.0	30.5	1.2	48.2	8.0	0.25	6.0	0.2	1.6	M30	118	44.3
36.0	36.5	1.2	58.2	10.0	0.25	6.0	0.2	1.6	M36	126	67.3
42.0	42.5	1.2	68.2	12.0	0.25	7.0	0.25	2.0	M42		111
48.0	49.0	1.5	75.0	12.0	0.25	7.0	0.25	2.0	M48		123
52.0	53.0	1.5	83.0	14.0	0.25	8.0	0.25	2.0	M52		182
56.0	57.0	1.5	87.0	14.0	0.25	8.0	0.25	2.0	M56		193
60.0	61.0	1.5	91.0	14.0	0.25	8.0	0.25	2.0	M60		203
64.0	65.0	1.5	95.0	14.0	0.25	8.0	0.25	2.0	M64		218

	CORPORATE STANDARD	AA0673604
		Rev. No. 05
		PAGE 1 of 3

PROCESS FOR PASSIVATION OF ZINC AND CADMIUM PLATED ARTICLES

1 GENERAL

This standard details the compositions of the passivation solution and the procedure for passivation of zinc and cadmium electroplated articles.

2 APPLICATION

To increase resistance to corrosion and finger marking.

3 COMPLIANCE WITH NATIONAL STANDARDS

This standard has reference to the following Indian standards regarding the quality of the passivated film:

IS 1340 : 1977: Code of practice for chromate conversion coating on zinc and cadmium coated articles and zinc base alloys

IS 1573 : 1986: Electroplated coating of zinc on iron and steel.

4 MATERIAL

Material	CPS No. / IS No. /Available From
Sulphuric Acid (Technical)	AA54101
Nitric Acid (Technical)	AA54102
Chromic Acid-Electroplating Grade	AA54104
Sodium Bichromate (Technical)	AA55612
Ginthox - Q.982 (L)	M/s Grauer & Weil (I) Ltd., Mumbai.
Ginthos – 995	
Kempas – 755	M/s Artek surfin Chemicals (P) Ltd., Mumbai
Zinc chrome 62L	M/S Platewel & process chemicals, Vadodara

5 EQUIPEMENT

5.1 Passivating Rinsing Tank

FRP/PVC lined mild steel tank preferable with heating arrangements.

5.2 Cascade Rinsing Tank

FRP/PVC lined mild steel tank with suitable partitions and provided with running water facilities, water cascading from one partition to the other

5.3 Acid Treatment Tank (Optional)

FRP/PVC lined mild steel tank

5.4 Rinsing Tank - After Acid Treatment - (optional)

FRP/PVC lined mild steel tank

Revisions: As per 40th MOM of MRC-CPO			APPROVED: INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC (CPO&NM)		
Rev. No. 05	Amd. No.	Reaffirmed	Prepared HEEP, Haridwar	Issued Corp. R&D	Dt. of 1st Issue 01-02-1986
Dt: 26-05-2012	Dt:	Year: 2021 49			

5.5 Hot Air Oven

Hot air oven suitable for heating 50-70°C

5.6 Centrifugal Drier

A standard centrifugal drier suitable for dying barrel components

6 COMPOSITION/PREPARATION OF SOLUTIONS & OPERATING INSTRUCTIIONS

6.1 Passivating Solution

6.1.1 Composition and Operating Conditions

The passivating solution shall be made of any one of the following compositions and operating conditions

6.2 Preparation of solution

6.2.1 The tank shall be filled with water preferably demineralised water to about two-thirds of its capacity.

6.2.2 The required amount of salt/chemical shall be added to the bath in small quantities with stirring.

6.2.3 After complete dissolution, the required quantity of recommended acid shall be poured to the solution with stirring.

6.2.4 Finally, the solution shall be brought to the operating level by adding water.

6.3 Maintenance of the solution

Any deficiency of the acid from the above composition shall be corrected by cautions addition of concentrated acid.

After the solution has been working from some time/and or any deficiency in the solution, if observed, then the passivating chemicals shall be added to keep the solution upto the working strength, or if required a fresh solution shall be prepared. While making the addition the salt shall be dissolved in the separate acid resisting container with the required quantity and then added to the tank.

7 PROCESS

7.1 Acid Treatment

7.1.1 Zinc/cadmium plated, heat treated articles after proper rinsing, shall be dipped in 0.4 to 0.5% nitric acid solution for 5-10 seconds.

7.1.2 After acid treatment, the articles shall be rinsed in clean cold running water.

7.2 Passivation

7.2.1 The articles shall then be immersed in the passivating solution as specified in clause 6.1.1 for 10 to 30 seconds.

7.2.2 The articles shall be drained for about 30 seconds after passivation.

7.2.3 The passivated articles shall be double rinsed in cold water for a period sufficient to ensure that water draining from the articles contains no trace of yellow colouration. The total rinsing time shall not be longer than 5 minutes.

7.2.4 After rinsing, the articles shall be dried off using air oven/compressed air. In case of barrel plating, the articles shall be dried by means of centrifugal drier.

7.3 Age Hardening

No article shall be used in assemblies within 24 hours of age hardening after passivation.

Note:

After passivation, no heat treatment of the plated articles shall be done.

8 INSPECTION

8.1 Visual

All the jobs shall be tested visually the passivated film shall have a greenish iridescent or greenish yellow iridescent appearance, free from areas of unconverted zinc or cadmium plating.

8.2 Adhesion (IS 8602)

Adherence may be determined after age hardening by rubbing the surface with white paper. The paper must not show more than a slight trace of stain and the treated surface shall not show signs of having been rubbed through.

8.3 Chromate Film Test (IS 1573)

The chromate film shall be free from bare (unconverted zinc) patches and shall be adherent.

9 REFRRED STANDARDS (Latest Publications Including Amendments)

1) IS 1340
2) IS 1573
3) IS 8602
4) AA54101
5) AA54102
6) AA54104
7) AA55612

BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL

QUALITY ASSURANCE PLAN FOR BRUSH HOLDER CLAMP TO BHEL ORDERING SPECIFICATION/DRAWING AS PER PO

QUALITY PLAN NO. – QAP/QTM/VENDOR QAP/2020-21/BRUSH HOLDR CLAMP DTD 16.02.2021 REV 00
Reference Document- PO DRAWING/SPECIFICATION

SL. NO	COMPONENT	CHARACTERISTICS	TYPE OF CHECK	QUANTAM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	INSPECTION AGENCY	REMARKS
				TP	TPIA					
1)	Raw material	All tests	TC verification	100%	100%	AA10108	As per drawing & Specification	MTC	BHEL/TPIA	TEST LAB NABL/EQUIVALENT ACCERDITED/SOURCE MILL /Supplier to get the raw material correlated with material TC
2)	Dimension	Dimension	TC verified & Measurement	100%	20%	As per drawing & specification	As per drawing & Specification	Supplier record	BHEL/TPIA	Witness
3)	Testing	Routine test	TC verified & testing	100%	10%	As per drawing & specification	As per drawing & Specification	Supplier record	BHEL/TPIA	Witness
4)	Identification vendor name, PO & job serial no.	Visual	Visual	100%	10%	As per drawing & specification	As per drawing & Specification	Supplier record	BHEL/TPIA	Witness
5)	Packing to avoid transit damage	Visual	Visual	100%	20%	As per drawing & specification	As per drawing & specification	-	BHEL/TPIA	Packing to be such that no damages should occur during transit

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