Bharat Heavy Electricals Limited

Fabrication Stamping &Insulator Plant
Jagdishpur, Amethi – 227817(U.P.)
MATERIAL MANAGEMENT

Notice Inviting Tender

Tender Enquiry No: TE-136/2022-23 **Dtd: 04/02/2023**

E-Tender is invited in Two Part Bid System for Procurement of Paint/Primer/Thinner as per BHEL Specifications/IS for entering into rate contract valid for 09 months from date of finalization.

(I) General:

1. The tender will be under two part bid system **(Techno-commercial & Price-bid).**

2. Mode of Submission of offer: Being e-tender, offer will be submitted online through e-tender portal:
https://eprocurebhel.co.in/nicgep/app
Important dates are given below:

EVENT	SCHEDULE
Last Date & Time for receipt of tender	Date : **14.02.2023** Time : 14.00 hrs (IST)
Tender opening date & Time (Part I)	Date **: 14.02.2023** Time : 15.30 hrs (IST)

3. In case of any difficulty faced while registering on BHEL's e-Procurement portal developed by NIC, queries may be addressed to 0120-4001002, 0120-4001005 and 0120-6277787; email: support-eproc@nic.in. These details are also available on 'Contact Us' page of the portal

4. Offer to be submitted only on e-procurement portal. Hard copy/email offer is not required to be submitted to BHEL-FSIP. **Any offer received in Hard copy/Email shall not be accepted and straightway rejected by BHEL-FSIP**

5. The offer shall be submitted as per the instructions of tender documents and as detailed in this NIT. Non acceptance of any term may lead to rejection of quotation.

6. **This tender is for Rate contract (Frame Work Agreement) and shall be valid for 09 months from date of finalization of tender. BHEL shall release PO within validity of rate contract for supply of Paint/Thinner/Primer.**

7. **Price Variation clause:** Prices shall be FIRM and valid for ordering up to 9 months from date of Framework Agreement/Rate Contract. GST shall be extra to the finalized price. Delivery terms shall be FOR BHEL Jagdishpur.
8. **Item Description:** As per Annexure A
9. **Scope of Supply:** Items to be supplied as per respective PO with TC/GC/Shelf Life etc as per terms of tender.

Notice Inviting Tender

Quantity variation +20% is allowed. However BHEL may release order of any individual item up to any limit but total variation in quantity/value of total tender shall be +20% only. The requirement is tentative and based on order book and market projection. BHEL is not bound to place POs for all the quantity mentioned in Annexure A.

Evaluation criteria:

Evaluation shall be done group wise (e.g A, B, C etc).

(II) Attachment to Tender Enquiry:

Sl. No.	Description	Annexure/Enclosure
1	General Terms & Conditions (Including Make In India declaration Format, Sister Concern Declaration and CA Certificate Format)	Enclosed
2	Special terms and Conditions	Enclosed
3	Technical Documents	Enclosed
4	Technical and other requirement	Enclosed (Annexure V)
5	Integrity Pact	Enclosed (Annexure-1)

(III) Contact person details:

Manmeet Kumar
Dy Manager –MM, SDC
Phone: 05361 224126/ 8427978877
E-mail: manmeet@bhel.in

SPECIAL TERMS AND CONDITIONS OF ENQUIRY (TE -136/2022-23 dated 04.02.2023)

Sl. No.	Description
1	**Test Certificate**
	1) Supplier to provide Shelf Life Certificate, Test Certificate and Guarantee Certificate along with each lot of supply. 2) Shelf Life of material must be minimum 1 year from date of its manufacturing. Also material of latest manufactured batch not older than 2-3 month should be supplied in a particular lot. 3) Supplier has to submit the Test Certificates of respective batches/ lot as per applicable standards or specifications of BHEL. *4)* Supplier to guarantee the material minimum for 1 Year from date of its acceptance at BHEL against any manufacturing defect.
2	**Product Requirement**
	Supplier has to supply material as per specifications/IS against respective Purchase Orders. Reference Specification are attached.
3	**Delivery time and term**
	Material delivery for each items of the PO to be made by supplier within **4 weeks** from date of respective PO. However material delivery schedule may increase or decrease as per mutual consent of BHEL with supplier. Prices shall be FIRM and valid for ordering up to **9 months** from date of Rate Contract. GST shall be extra to the finalized price. Delivery terms shall be **FOR** BHEL Jagdishpur.
4	**Distribution of Load Share**

Distribution Table

No of Techno-commercially Qualified Bidders	Distributed Between	Proportion	Remarks
≥3	2	60:40	If Counter offer accepted by 1 Bidder (Other than L-1)
	1	100	Non Acceptance of Counter offer by any bidder
=2	2	60:40*	If Counter offer accepted by 1 Bidder (Other than L-1)
	1	100	Non Acceptance of Counter offer by any bidder

*Distribution is based on BHEL Discretion

Supplier shall be among N-1 (N minus One) bidders. In case of only two techno-commercially qualified bidders distribution shall be as per BHEL discretion.
The loading of Order shares on suppliers will also be subject to their performance (Quality, Delivery and Service) for the supplies made against Purchase Orders. The suppliers with consistence good performance will be preferred over poor performance supplier and encouraged with more order share. Depending upon performance in supplies BHEL shall go to redistribute the pending orders/shares of poor performer to other suppliers whose performance in supplies is better.

Distribution shall be as per MSE clause and Make In India Clause (If applicable).

5	**Tender Finalization**
	Tender Finalization shall **through Reverse Auction after price bid opening**.

6	**PO Quantity Tolerances**
	Tolerance shall be +/- 5% for each item of respective PO.
7	**Supplier Registration**
	Suppliers who are not registered with BHEL FSIP, may submit supplier registration form through www.supplier.bhel.in for registering themselves.
8	*The evaluation currency for this tender shall be INR.*
9	*In case of any ambiguity referred terms and conditions of annexure- B shall supersede other terms of tender.*
10	**Conflict of Interest**
	"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. The bidder found to have a conflict of interest shall be disqualified. A bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if: **a)** They have controlling partner (s) in common; or **b)** They receive or have received any direct or indirect subsidy/ financial stake from any of them; or **c)** They have the same legal representative/agent for purposes of this bid; or **d)** They have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder,· or **e)** Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/Assemblies from one bidding manufacturer in more than one bid; or **f)** In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorize only one agent/dealer. There can be only one bid from the following: **1.** The principal manufacturer directly or through one Indian agent on his behalf; and **2.** Indian/foreign agent on behalf of only one principal, or **g)** A Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid,· or **h)** In case of a holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business. "

666910/2022/FSIP-FSIPMMX000

GENERAL TERMS AND CONDITIONS OF ENQUIRY

GTC/FSIP/PUR/01 Rev:01

Sl. No.	Description
1	**General:**
A	These General Terms & Conditions (GTC) shall apply to all enquiries, notice inviting tenders, request for quotations concerning the supply of goods and / or rendering of services to Bharat Heavy Electricals Ltd., Jagdishpur (hereinafter referred to as BHEL or the Purchaser) or its Projects / Customers. Special / supplementary terms and conditions of enquiry, if any, will override the conditions in this annexure.
2	**General Instructions - Common for Indigenous & Foreign enquiries**
A	**Through E- procurement-**
	1. Offer shall be submitted by the bidders in single / two parts as called in Tender enquiry. **2.** Bid Part - I Technical cum Commercial bid Bid Part - II Price bid **3.** Suppliers shall quote ***price*** on BHEL/authorised third party service provider **e-procurement site.** Any deviation from the price format shall be clearly brought out in the offer Bid part-I. The offer shall be uploaded on BHEL e-procurement site using Class III digital signature. **Bidders to put sign and seal on all the uploaded documents.** The quotation should be uploaded on the site before due date and time. Part-I of the bid shall contain complete item-wise scope of supply as offered vis-à-vis the scope of supply as per enquiry, all commercial terms and conditions etc. It is expected that bidders shall meet all our technical and commercial requirements and shall not deviate from them.
B	**Through Tender Room**
B1	Sealed bids are invited for scope of Supply / Services as detailed in the enquiry. The quotation should be neatly typed and free from over writing/ erasures. Any correction or addition must be authenticated. The bid should be submitted in English or Hindi language. Relevant enclosures, supporting documents, catalogue, samples, if any, as required as per Notice Inviting Tender (NIT) conditions shall be sent along with technical offer. Rate should be quoted in the units asked for in the enquiry. The rates should be quoted both in figures and words. In case of discrepancy in figures and words, the rates quoted in words shall be considered.
B2	Bids shall be submitted in a Sealed cover with Enquiry No., Due date and Bidder's name indicated on the cover. In case of Two part Bid, technical bid containing technical offer, mandatory documents filled-in & signed; and **un-priced copy** of the tender should be kept in one envelope. Price Bid containing only the price (as called for in the price format where required) should be kept in a separate envelope. Both envelopes indicating Part-I or Part-II as the case may be to be put in a bigger envelope, which should be addressed to In charge, Tender Box, Administrative Building BHEL FSIP, Industrial Area Jagdishpur, Dist. Amethi-227817, (U.P.) India. Enquiry No., due date and bidder's name must be mentioned on all envelopes. Offer must reach tender box of BHEL FSIP Jagdishpur by 15.00 PM IST on the enquiry due date.
B3	Offer received after **15.00 PM IST** of the due date will be termed as "Late Tender" and shall not be considered.
B4	Bidder can also submit offer through email, if called for in the enquiry, at the email address indicated in the enquiry. Such email offers shall be sent only on designated email-id to reach before 15.00 PM IST on the tender due date. BHEL will not be responsible for incomplete offers and the ones delivered late through e-mail.
C	Commercial Conditions quoted by the vendor in any place including as stated in bidder's 'General Terms and Conditions' if any, shall not be binding on the Purchaser and the conditions contained in this annexure, including special conditions, if any, for this enquiry shall only prevail.
D	**Wherever Reverse Auction is called for** **REVERSE AUCTION (RA):** "BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among the techno-commercially qualified bidders. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered for RA. In case any bidder(s) do (es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking." **Wherever Reverse Auction is not called for** **PRICE BID OPENING:** Tender shall be finalized via price bid opening of all the techno-commercially qualified bidders in place of RA.

	Price bid should contain only price of item. Anything other than price of item shall be invalid. *Tender finalization mode (RA or Price bid opening) shall be specified in Special / supplementary terms and conditions of enquiry.*
E	The goods offered shall confirm to BHEL specifications and / or National/International standards as mentioned in the Enquiry and the bidder is required to confirm his unconditional acceptance to the same. Vendors, seeking deviations from the specifications and any other conditions, may indicate the same clearly on a separate sheet, with reasons for such deviations. **BHEL reserves the right to reject the offer with deviations or load the deviations suitably for evaluation.**
F	Offers shall be submitted directly by vendor or his authorized agent only. Unsolicited offers shall be summarily rejected.
G	Bid in single part or techno-commercial bid in **two-part** system (as the case may be) will be opened on the due date. In case of two part bid, price bids of techno-commercially acceptable bidder(s) only shall be opened on the assigned date.
H	In case of changes in scope and / or technical specification and / or commercial terms & conditions, having price implication, techno-commercially acceptable bidders shall be asked by BHEL to submit the impact of such changes on their price bids. In case a bidder opts to submit revised price bid instead of impact called for, then latest price bid shall prevail.
I	The bidders will submit Integrity Pact, duly signed by its authorized signatory, where called for in the enquiry.
J	Wherever the enquiry is issued to unregistered vendor, the bidder shall visit ' www.bhel.com and online filled up “Supplier Registration Form” on BHEL link (http://supplier.bhel.in) along-with all the supporting documents to be submitted.
K	BHEL expects that the bidder must respond to the enquiry. Regret letter, with valid reasons for not participating in the tender will be submitted where the bidder is unable to submit offer. Repeated lack of response on the part of vendor (Four non responses) may lead to his deletion from BHEL's approved vendor list.
L	Goods shall be properly packed to avoid transit damage. Suitable markings shall be provided to identify the goods with that of the PO No. and the consignee details.
M	Goods shall be consigned to Store Officer, BHEL, FSIP, IA Jagdishpur Dist- Amethi (U.P.) India, unless otherwise specified in the PO.
N	All corrigenda, addenda, amendments, time extensions, clarifications etc. to the tender will be hosted on BHEL website (www.bhel.com)/https://eprocure.gov.in/epublish/app/ https://eprocurebhel.co.in/nicgep/app eProcurement website only.
O	**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-1bidders.** **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. BHEL's decision in such situations shall be final and binding.**
P	The Purchaser can consider awarding tendered quantities among more than one bidder (after acceptance of L1 price by the other bidders) in the manner and proportion disclosed in the tender conditions. Purchaser can also consider awarding of part of the tendered quantity to other than L-1 bidder at **L1** counter offered rates, if the quantity offered by the L-1 bidder is less than the quantity tendered for. BHEL can also award order to L1 bidder/counter offer accepted bidders in case any bidder is not supplying/delaying the supplies and in this case the distributed quantity shall not be considered in loading share. The loading of Order shares on suppliers will also be subject to their performance (Quality, Delivery and Service) for the supplies made against Purchase Orders. The suppliers with consistence good performance will be preferred over poor performance supplier and encouraged with more order share. Depending upon performance in supplies BHEL shall go to redistribute the pending orders/shares of poor performer to other suppliers whose performance in supplies is better.
Q	The bidder shall submit price bid strictly in the price format, wherever provided for, in the enquiry. Any attempt on the part of the bidder to alter the contents of the price bid format in any manner, which in the opinion of BHEL can vitiate the tendering process, will lead to rejection of the bid, ***besides BHEL taking appropriate punitive action as deemed fit.***

R	In case the bidder decides to sub-contract part of his activity / work to some of his vendors, details of such intended subcontracting shall be mentioned in the bid. This will however not absolve the bidder from his contractual obligations and responsibilities.	
S	Wherever the minimum reserved capacity is called for in the tender, the offers of such bidders, who do not quote for the minimum reserved capacity, are liable to be rejected.	
3	**Delivery Terms**	
A	**Indigenous Purchase**	
	Goods shall be delivered on 'FOR Destination' basis (with freight and insurance in bidder scope) to the named destination unless otherwise called for in the enquiry.	
B	**Foreign Purchase — Imports**	
B1	1. Goods shall be despatched by Sea, unless stated otherwise in the enquiry or purchase order. 2. Terms of Delivery for Sea shipment shall be on CFR / CIF basis with 14 days' detention free period for FCL (Full Container Load) Cargo of GP & HC Containers. 3. For other cases - Other than GP & HC Containers, LCL Cargo shall be delivered at Nhava Sheva (JNPT) & Break-bulk Cargo at Mumbai (MPT). 4. For Air consignments, the terms of delivery shall be FCA at BHEL nominated Airport. 5. Freight amount shall be indicated separately in the offer in case of CIP/CFR/CIF. 6. The number of detention free days and destination charges payable to shipping line must be mentioned in your offer and also on the Bill of Lading. 7. Offer received on FOB basis may be considered on an exceptional basis. BHEL will load freight, marine insurance & shipping line port handling charges etc. to work out landed cost at Sea Port. 8. Please visit BHEL Bhopal website www.bhelbpl.co.in for details of named Air ports and Sea ports. Name of the gateway port so chosen by the Seller shall be indicated by the Bidder in his offer.	
B2	1. For delivery of FCL (Full Container Load) cargo, the Bidder shall provide minimum **14 days' detention free period** from the date of delivery at Port of Discharge / Place of Delivery (in case of ICD). Wherever the detention free period offered is less than 14 days, the bids shall be **loaded** for the period short of 14 days' period. 2. *Port Congestion charges or any additional charges claimed by the shipping line at Port of Discharge / Place of Delivery shall be to the Seller's account.*	
4	**Vendor's particulars & logistics information (Bidder to give details against each of the provisions)**	
A	Name of the vendor's executive to deal with this tender / project	
B	E-mail address of the contact person	
C	Telephone no. of the contact person	
D	Name of location from where the goods shall be offered for inspection and dispatch	
5	**Additional logistics information for Imports**	
A	Bid currency	
B	Charges applicable at discharge port up to BHEL's CFS (Container Freight Station) to be indicated in your offer and on the B/L	
C	Name of Airport in the country of dispatch for FCA delivery terms	
D	Estimated number, type & size of containers for delivery of tendered	

	quantity (applicable where the goods are to be sent in FCL)	
E	No. of packages with cumulative gross weight and CBM volume (applicable for LCL & Break-bulk shipment)	
F	Approx. distance in km. from Vendor's works to Port of Loading	Sea port /Air port
6	**Delivery Schedule & Completion date**	
A	• Instead of writing specific date against delivery offered, bidder shall commit delivery period in number of days / weeks/ months to suit the delivery period indicated in the enquiry. • Commencement of delivery period shall be reckoned from the date of PO / LOI or any other agreed milestone. • Seller shall deliver the goods in the manner and schedule agreed under the Purchase order. • Goods shall be delivered within contractual period or any extension thereof, if any, granted by the Purchaser. • If delivery is linked to approval of documents, time for submission of such documents to be indicated and delivery period to be indicated from approval of documents. This delivery schedule will be considered for processing delivery extension, wherever applicable. • BHEL reserves the right to cancel the order if material is not delivered within PO scheduled delivery. • In case of unsatisfactory performance on quality / delivery BHEL will have right to discontinue the contract in part or full.	
B	In case of foreign supplies, the date of Bill of Lading (B/L) or AWB shall be taken as actual date of delivery.	
C	In case of Indigenous bidders, the date of delivery at named destination in India shall be taken as contractual delivery completion date where delivery terms are FOR destination. In case of 'Ex-works' delivery terms, the date of LR / RR shall be the contractual delivery completion date.	
7	**Transit Insurance**	
	Except where delivery terms are agreed on CIF basis for Imports & FOR destination basis for indigenous purchases, transit insurance will be covered by BHEL under its Open Marine Transit Insurance Policy. Seller shall inform dispatch particulars with value of consignment to the Purchaser within 07 days of dispatch for BHEL to arrange insurance coverage in its policy. Failure on the part of seller to inform dispatch particulars will make him liable to pay for any transit damages / losses suffered by the Purchaser.	
8	**Force Majeure**	
	Notwithstanding anything contained in the contract, neither the Seller nor the Purchaser shall be held responsible for total or partial non-execution of any of the contractual obligations, should the obligation become unreasonably onerous or impossible due to occurrence of a 'Force Majeure' which directly affects the obligations to be performed by the Purchaser or the Seller; Such events include war, military operations of any nature, blockages, revolutions, insurrections, riots, civil commotions, insurgency, sabotage, acts of public enemy, fires, explosion, epidemics, quarantine restrictions, floods, earthquake, or acts of God, restrictions by Govt. authorities; over which the Seller or the Purchaser has no control. The party claiming to be affected by force majeure shall notify the other party in writing without delay, within two weeks on the intervention and on the cessation of such circumstance. Extension of time sought by the Seller along with supporting evidence and so granted by the Purchaser for the supply/ work affected, if any, shall not be construed as waiver in respect of remaining deliveries. Rescheduling of deliveries on account of force majeure conditions, if so agreed by the Purchaser, will not entail the Seller to claim any increase in the price on whatsoever account. Notwithstanding above provisions, Purchaser shall reserve the right to cancel the order/ Contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements. If deemed necessary, Purchaser may takeover partly processed material at a mutually agreed price.	
9	**LD/Penalty for delayed performance.**	
A	Subject to force majeure conditions, I. LD shall be 0.5 % of the total order value per week of delay or part thereof subject to a maximum of 10% of the total order value.	

	II. In case of staggered delivery schedule, LD shall be 0.5 % of the undelivered portion per week of delay or part thereof subject to a maximum of 10% of the total order value. However, even if a staggered delivery schedule for Capital Machine / BOPs is agreed, the LD cap will be levied on total order value and not undelivered portion of the order value. III. In case of any amendment/ revision, the LD shall be linked to the amended / revised PO value. Any deviation from the above LD clause shall be specified separately in the NIT. Any loading on LD/penalty clause shall be to the extent to which it is not agreed to by the bidder (at offered value). The same shall be intimated separately prior to price bid opening. **Note:** **"Recovery of LD will include GST as applicable".**
	In case the contractually agreed delivery date falls on a holiday in BHEL FSIP Jagdishpur, the next working day shall be taken as contractual delivery date for compliance and applicability of LD / penalty.
B	**Risk Purchase**
	If the material is not supplied within the agreed delivery period, BHEL reserves the right to cancel the order and purchase the material from alternate source (s) at the Risk and Cost of the Seller. In such an event, it shall be obligatory on the part of seller to make good any loss suffered by the purchaser.
10	**Indian Agents and Agency commission**
A	BHEL prefers to deal directly with Foreign vendor, wherever required, for procurement of Goods. However if the Foreign Principal desires to avail services of an Indian Agent, then the Principal should ensure compliance to "regulatory guidelines" which will require submission of an agency agreement.
B	The CFR / CIF price quoted will be deemed to be inclusive of Indian Agency commission. Agency commission as disclosed by the bidder in his quoted CFR / CIF price will be paid in Indian Rupees on receipt & acceptance of Materials or it's installation at destination, as the case may be. The lower of the 'TT buying rate prevailing on the date of technical bid opening or price bid opening shall be considered for computation of Agency commission.
C	In a tender either the Indian Agent on behalf of Principal / OEM or the Principal / OEM itself can bid, but both cannot bid simultaneously for same item / product in the same Tender. In case bids are received from both the Principal / OEM and the agent, bid received from the agent will be ignored.
D	If an agent submits Bid on behalf of the Principal / OEM, the same agent shall not submit bid on behalf of another Principal / OEM in the Tender, for the same Item / Product.
11	**Documentation:**
A	**Indigenous Purchase**
	Seller shall arrange to send to the consignee, Original Tax invoice (Buyer's copy and duplicate for Transporter), Commercial invoice in duplicate, consignee copy of LR & 2 sets each of Packing list, Test certificate, Guarantee / Warranty certificate, O & M manuals (where applicable), immediately on despatch of the goods. The distribution of such documents will be specified in the Purchase order.
B	**Foreign Purchase — Imports**
	A. Vendor to share immediately Bill of lading with Import Invoice and packing list of material at mssea@bhel.in and incorporate following detail in the bill of lading: **a. Import & export Code (IEC) of importer;** **b. GST Identification No (GSTIN) of importer;** **c. Official email id of importer (to be used for correspondence by shipping lines and Customs) – mssea@bhel.in to be included.** B. Seller shall send **1** set of following documents, in English, within 7 days of B/L date / 1 day of AWB date by courier to the Purchaser. 1. Express / Original 'Clean on board' Bill of Lading / AWB. 2. One set of Commercial Invoice, Packing list indicating container-wise Gross weight, Net weight, CBM volume, No. of packages with Dimensions of each package.

	3. Original Certificate of Country of Origin issued by Chamber of Commerce. 4. One set of Original Test Certificates and O&M Manual where called for. 5. Fumigation / Phyto Sanitary Certificate wherever cargo is packed in wooden packing or packing of plant origin material is used. 6. Supplier should additionally forward 2 sets of original documents mentioned at point 1 to 5 along with original bill to Lading through any international courier service / registered airmail or AWB by captain's mail within three days of obtaining the same directly to the following: (i) AGM (M.S) Regional Operations Division BHEL 14th Floor Centre-1 World Trade Centre, Cuffe Parade Colaba, Mumbai 400 005 INDIA E-mail: mssea@bhel.in (ii) SDGM (FIN) Administrative Bldg. BHEL, FSIP, IA Jagdishpur Amethi, 227817, UP, India E-mail : shashi.kumari@bhel.in And **confirm forwarding details** to DGM (MM), BHEL, FSIP, IA Jagdishpur 227817, Amethi , UP, India at nasaifi@bhel.in /pkyadav@bhel.in/vjain@bhel.in. 7. In case the Seller decides to negotiate all 3 originals of B/L / AWB along with all original documents through negotiating Bank, non-negotiable documents (NNDs) consisting of copy of B/L / AWB & documents mentioned at Sl. no. 11- B2 to B5 will be sent by e-mail to the Purchaser at his e-mail address given in the PO with one copy to be mailed at ***nasaifi@bhel.in*** & ***vjain@bhel.in*** (for sea shipment). Other documents, as required, will be separately indicated in the Purchase Order. Additional expenditure, if any, incurred by the Purchaser by way of detention / demurrage, resulting out of delay attributable to the Seller in providing Negotiable documents, will be recovered from the Seller. In case any discrepancy is raised by bankers / BHEL with respect to documents submitted, vendor to facilitate clearance of goods through Delivery Order.
C	**General**
	1. For Hazardous chemicals, the materials safety data sheet (MSDS) is to be submitted. 2. All certificates as called must be sent. BHEL may test any goods supplied and their decision is final irrespective of supplier's certificates. If test certificate and guarantee certificate are not received along with the document and stipulated in these specifications, BHEL reserves the right to get the material tested and recover the expenses from the supplier without awaiting supplier's confirmation
12	**Pricing Terms:**
	Prices once quoted shall remain firm within the validity or any extension thereof for placement of order, till complete execution of the order, without any escalation / increase for any reason, whatsoever, unless specifically provided for in the Enquiry & PO. In case of foreign vendors, the quoted price shall be taken as inclusive of Third Party Inspection and testing charges as called for in the NIT.
13	**Price Validity :**
	Unless stated otherwise in the enquiry, offer shall be valid for a period of **90 days** from the date of Techno- commercial (Part-I) bid opening date.
14	**Taxes & Duties - Indigenous Purchase:**
A	Vendor to ensure timely remittance of SGST, CGST, IGST as applicable in time as per law.
B	Vendor to ensure compliance to filing of monthly GST sales return including BHELs supplies by 10th of next calendar month in the online GST portal wherever applicable.
C	Vendors to declare filing of timely returns and GST remittance / likely remittance / ITC adjustment along with invoice.
D	Vendor to submit invoices compliant with GST invoice Rules
E	Vendors to comply with all statutory provisions as may be applicable at the time of despatch / sale. Any additional financial liability to BHEL on account of non-compliance by vendors shall be borne by them and shall be adjusted / recovered from the vendors. BHEL reserves the right to review the existing offers / contracts for any revision in terms, which may arise due to change in any statutory provisions to ensure that the benefit accrues to BHEL.

F	Vendor to ensure TAX INVOICE submission along with consignment
G	In respect of cases where the liability to discharge GST is on BHEL under reverse charge mechanism, vendors have to ensure timely submission of invoices and delivery of material / services to BHEL, so that there is no mismatch on both activities. In case there is any additional financial liability on BHEL on account of default on the part of the vendor on submission or delivery of material / services the same shall be passed on to them. In respect of free issue material by BHEL, vendors have to return the processed material within the time line as per the provisions of GST. In case of any additional tax liability on BHEL on account of non-compliance by the vendor, the additional financial implications on BHEL shall be passed on to the vendor.
H	Vendors to provide the applicable HSN / SAC codes as called for in the enquiry
15	**Taxes & Duties - Foreign Purchase — Imports**
	The offered prices shall be inclusive of all the Taxes and duties as applicable in the country of bidder / country of dispatch for the quoted CFR / CIF price.
16	**Payment Terms-**
A	**Indigenous:** 100% payment in 90 days of receipt (45 days for MSE including NSIC / Udyog Aadhar/UDYAM/EM-II/DIC along with valid CA certificate, registered suppliers as per relevant act in force), subject to acceptance of material at BHEL, on direct presentation of the documents. In case of despatch of material to site directly, site certification for receipt of materials is required unless otherwise provided for in the PO.
B	**Foreign:** 100% direct Payment payable on 90th day of B/L / AWB.
	Any deviation from the above payment terms, if accepted (by BHEL), shall be loaded as per below point: (i) 'Base rate of SBI (as applicable on the date of bid opening; Techno-commercial bid opening in case of two part bids) + 6%' shall be considered for loading for the period of relaxation sought by bidders. (ii) Wherever LC payment terms are not offered in NIT and the same is insisted by bidder(s), all LC related bank charges to be incurred by BHEL shall also be loaded. (iii) In case of deviation w.r.t. LC payment terms offered in NIT, the loading shall be done for all LC related bank charges to be incurred by BHEL.
C	Foreign vendors to submit declaration of **Permanent Establishment and Business Connection (PEBC**) for remittances purpose. Declaration to be submitted in formats in either Annexure A or B whichever is applicable as per their transaction entered into with BHEL. In the absence of certificates from the vendor, withholding tax at applicable rates along with surcharge and cess will be recovered at the time of remittance to the vendor.
D	Foreign vendors to submit **Tax Residency Certificate (TRC) & Form 10 F** (for obtaining DTAA benefits) as per Annexure C in respect of services. The TRC (tax residency certificate) is to be issued by the authorities of the government of vendor's country. If the informative part of the format (other than residency) is not furnished by the authorities the same may be furnished by the vendor as a declaration.
17	**Inspection of Goods**
A	The Seller shall give adequate notice, of 1 week or as mutually agreed period, in writing to the Purchaser (in case Customer inspection is involved) or BHEL appointed TPIA about the date and place at which the goods will be ready for inspection/ testing, as provided for in the contract.
B	Purchaser or his authorized representative shall be entitled to carry out inspection of material and Workmanship / Surveillance Audit at Seller's premises or at his sub-contractor's premises at all reasonable times during execution of contract; Such inspection, examination and testing, if made, shall not absolve the Seller from his obligations under the contract. Wherever required, BHEL may carry out testing at BHEL's testing Lab and in case of any rejection during such testing, replacement / rectification, as required, will have to be done by Supplier. If BHEL carries out any rectification of such rejected material, such cost will be recovered from Supplier's Bills. In case of Customer inspection as Supplier's Works, inspection clearance to be obtained from Customer and submitted to BHEL.

C	BHEL's representative from unit or Corporate Quality (CQ) is authorised to carry out audits along with TPIA at vendor's works before clearing the items for despatch.
D	All costs related to inspections and re-inspections shall be borne by the Seller. In case of inspection by BHEL and / or BHEL's customer, the cost of to & fro passage and Boarding & Lodging shall be borne by the Purchaser / Customer, unless otherwise specifically agreed. In case of foreign vendors, the cost of third party inspection, where called for, shall be deemed to be included in the quoted price. Seller shall be responsible to provide assistance such as labour, materials, electricity, fuels, stores, apparatus, instruments at his cost, as may be required and as may be reasonably demanded to carry out such tests effectively.
E	**REJECTION:** If any goods are rejected, BHEL shall be at liberty to take action as per following at the risk and cost of supplier: a) Allow the supplier, wherever mutually agreed, to rectify the rejected goods at BHEL's works within reasonable time as fixed by BHEL. or b) Allow the supplier to make free replacement within a specified period. Rejected goods can be lifted by the supplier there after. or c) In case payment has been done, allow supplier to refund equivalent value of rejected material by NEFT / RTGS or furnish Bank Guarantee for same amount before lifting the rejected goods. Fresh replacement shall be regulated as per terms and condition of the original Purchase Order. In case payment has not been done, allow the supplier, wherever mutually agreed, to rectify the rejected goods at supplier's works within reasonable time as fixed by BHEL. or d) Take alternate procurement action from elsewhere and recover the difference in total cost to BHEL including services, if any, incurred by BHEL in this regard from the supplier. The supplier shall not be entitled to any gain on repurchase. or e) Terminate the contract either in part or in whole at the discretion of BHEL and recover the loss, if any, from the supplier. or f) Any goods rejected by BHEL must be removed by the supplier after making payment through NEFT / RTGS within 45 days from the date of intimation of rejection or 30 days after receipt of the intimation of rejection whichever is earlier. If vendor fails to lift or allow despatch of rejected material at his cost within 90 days from the intimation of rejection, his claim on rejected material shall cease.
	REJECTION: **The supplier shall arrange replacement/repair within one month from the date of rejection intimation upon failure on supplier's part to comply. BHEL will take whatever appropriate action they may think fit in addition to repair/return of rejected material at the cost and risk of the supplier.**
18	**Guarantee / Warranty and corresponding Repairs / Replacement of Goods**
	Manufacturer's works test / infection certificates shall be furnished along with the guarantee that material conforms strictly to the specification for general & special conditions as laid down in the purchase order. Goods shall comply with the specifications for material, workmanship and performance. The warranty shall be for a period of 12 months from the date of receipt. If the delivery is found non-compliant during the warranty period, leading to rejection, the Seller shall arrange free replacement / repair of goods, within one month from the date of intimation or any mutually agreed period. The rejected goods shall be taken away by the Seller at his cost and replaced on Delivered Duty Paid (DDP) (FOR - BHEL Stores / designated destination basis) within such period. In the event of the Seller's failure to comply, Purchaser may take action as appropriate, including Repair / Replenish rejected goods & disposal of rejections, at the risk & cost of the Seller. In case the defects attributable to Seller are detected during processing of the goods at purchasers/ his subcontractor's works, the Seller shall be responsible for free replacement / repair of the goods as required by the purchaser.
19	**Evaluation and Loading Criteria:**

	Evaluation of the tender shall be on the basis of delivered cost, i.e. 'total cost to BHEL' w.r.t the technical scope and commercial conditions finalized after techno-commercial clarifications (after considering, inter alia, Customs Duty and GST / Other taxes as applicable). Exchange rate (TT selling rate of State Bank of India) applicable on the date of Part-I bid opening shall be considered for evaluation of foreign bids. If the relevant day happens to be a bank holiday in India, then the FOREX rate as on the previous bank working day shall be taken for evaluation. Foreign suppliers shall ensure that the benefits as applicable under Comprehensive Economic Partnership Agreement (CEPA) with Government of India are disclosed in the bid & relevant documents such as Certificate of Country of Origin, issued by the appropriate authority in the country of Export is provided by the vendor along with dispatch documents. Bids shall be evaluated with such applicable benefits. In the event of Seller failing to provide appropriate documents for Purchaser to avail disclosed concessional duty benefits in India, financial loss, so incurred, will be to the Seller's account.
	The evaluation currency for this tender shall be INR.
20	**Variation of orders**
	No variation to the Purchase order is permitted unless authorised in writing and signed by or on behalf of purchase executive, BHEL Jagdishpur.
21	**Sub-contract**
	BHEL's order or part there off, if further to be subcontracted in exceptional circumstances the details of subcontracting and to whom to be subcontracted shall be furnished to BHEL and written permission shall be obtained from BHEL. However, it shall not absolve the supplier of the responsibility of fulfilling BHEL order requirements.
22	**Recovery / deductions of amount from supplier**
	A) Any amount on account of recovery from consignor / supplier under any condition shall be liable to be adjusted against any amount payable to the consignor / supplier against bills. B) For any deficiency in supplies where deduction is involved, an amount as decided by BHEL, shall be deducted from supplier's bills.
23	**Safety clause for Purchase Orders**
	The vendors shall maintain and ensure sufficient safety measures as required for inspections and test like HV test. Pneumatic test, Hydraulic test Spring test, Bend test, Material handling and safe working environment etc. to enable Inspection Agency for performing inspection. The vendor shall ensure that all the safety precautions specified in factories Act 1948 chapter-IV Section-21 to 41 are complied with respect to equipment's to be inspected. If any test equipment is found not complying with proper safety requirement, then the inspection agency may withhold inspection, till such time the desired safety requirements are met.
24	**Non-Disclosure Agreement**
	All Drawing and technical documents relating to the product or it's manufacture submitted by one party to the other, prior or subsequent to the formation of contract, shall remain property of the submitting party. Drawing, technical documents or other technical information received by one party, shall not without the consent of the other party, be used for any other purpose than that, for which they were provided. Such technical information shall not without the consent of the submitting party, otherwise be used or copied, reproduced, transmitted or communicated to a third party. Patterns supplied by BHEL will remain BHEL's property which shall be returned by the bidder on demand to BHEL. Bidder shall in no way share or use such intellectual property of BHEL to promote his own business with others. ***BHEL reserves the right to claim damages from the bidder, or take appropriate penal action as deemed fit against the bidder, for anv infringement of the provisions contained herein.***
	DRAWINGS, PATTERNS & TOOLS: All drawings, patterns & tools supplied by BHEL or made at BHEL's expense are BHEL's property. These cannot be used or referred to any other party and must only be used in the execution of BHEL's orders. These should be preserved at the supplier's cost for a period of not less than 5 years. Patterns & tools should be returned to BHEL within 90 days of issue of the same.
25	**Settlement of Disputes & Arbitration**
A	All questions / interpretations regarding subject matter of the Contract shall be decided by the Purchaser on the request of the Seller and the decision of the Purchaser shall be final.
B	In case of dispute, steps shall be taken by the parties to the contract to settle the same through negotiations.

C	In case, dispute is not settled in negotiations, it shall be referred to Conciliator appointed by the competent authority of the Purchaser.
D	Except as provided elsewhere in this Contract, in case amicable settlement is not reached between the Parties, in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract, then, either Party may, by a notice in writing to the other party refer such dispute or difference to the sole arbitration of an arbitrator appointed by Head of the BHEL Unit/Region/Division issuing the Contract. The Arbitrator shall pass a reasoned award and the award of the Arbitrator shall be final and binding upon the Parties. Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or Statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Lucknow. The cost of arbitration shall be borne as per award of the Arbitrator. Subject to the arbitration in terms of Clause above, the Courts at Lucknow shall have exclusive jurisdiction over any matter arising out of or in connection with this Contract. Notwithstanding the existence or any dispute or differences and / or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner except where the Contract has been terminated by either Party in terms of this Contract.
	In case of Contract with Public Sector Enterprise (PSE) or Government Department, the following shall be applicable: In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred by either Party for arbitration to the sole arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitration under this clause. The award of the arbitrator shall be binding upon the Parties to the dispute, provided, however, any Party aggrieved by such award may make further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by Law Secretary, whose decision shall bind the Parties hereto finally and conclusively. The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.
E	The Seller shall continue to perform the contract, pending settlement of dispute(s).
26	**Applicable Laws and Jurisdiction of Courts**
	Indian laws both substantive and procedural, for the time being in force, including modifications thereto, shall govern the Contract including Arbitration proceedings. The competent Courts at Lucknow in the State of Uttar Pradesh, India shall have sole jurisdiction.
27	**RIGHT OF REJECTION /NON- PLACEMENT OF PO:** BHEL reserves the right to accept the offers in part or in full, or cancel the Tender enquiry without assigning any reason.
28	**Performance Bank Guarantee (PBG) / Security Deposit (SD)-(If applicable)**
A	Wherever PBG/SD (covering equipment / system / work performance guarantee) **is** called for in the Notice Inviting Tender (NIT) deviation shall not be accepted.
B	Bank Guarantee wherever called for, shall be in the BHEL prescribed format. In case the order is to be placed in foreign currency, the BG must also be in Foreign currency, so specified by the Purchaser.
C	Wherever Security Deposit (covering contract performance) is called for in the NIT, deviation shall not be accepted.
D	Composite 'Contract Performance Bank Guarantee' of matching value / validity, where both Security Deposit and Performance Bank Guarantee are required, shall not be construed as deviation.
E	Wherever the contract is for supply of Goods processed on labour basis from BHEL supplied materials, the materials shall be issued against a suitable Bank guarantee as specified in the Enquiry.
29	**Benefits earmarked for Purchase from Micro & Small Enterprises (MSEs) — Indigenous Purchase**
A	MSE bidders shall submit along with bid relevant documents w.r.t. their respective MSE status as per extant norms. Date to be reckoned for determining the deemed validity will be the last date of Technical bid submission. Non- submission of such document will lead to consideration of their bid, at par with other bidders and MSE status of such bidders shall be shifted to Non- MSE supplier till the supplier submit these documents.

B	In tender, participating MSEs quoting price within price band of L1+15% shall also be allowed to supply a portion of requirement by bringing down their price to L1 price in a situation where L1 price is from someone other than a MSE and such MSE shall be allowed to supply up to 25% of total tendered value. In case of more than one such MSE, the supply shall be shared proportionately. A quantum of 6.25% out of 25% quantity, so earmarked, will be reserved for MSE's owned by SC / ST entrepreneurs who submit their bid with relevant documents provided that in event of failure of such MSE(s) to participate in tender process or meet tender requirements and L1 price, 6.25% sub-target for procurement earmarked for MSE(s) owned by SC or ST entrepreneurs shall be met from other MSE(s). **Special provision for Micro and small enterprises owned by Women in following cases**: - 3% reservation for women owned MSEs under following conditions i. In case of Proprietary MSE, proprietor is woman. ii. In case of partnership MSE, the woman partner is holding at least 51% share in the unit. iii. In case private limited companies, at least 51% share is held by woman promoters. **In case of indivisible tender the full quantity shall be awarded to L1.**
C	If an enterprise falling under MSE category as defined in the MSMED Act 2006, graduates to a higher category from it's original category or beyond the purview of the Act, it shall continue to avail all non-tax benefits of it's original category notified by the Ministry of Micro, Small and Medium Enterprise for a period of three years from the date of such graduation to the higher category.
D	MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) or valid NSIC certificate or EM II certificate along with attested copy of a CA certificate (As per BHEL Format, where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid). Non submission of such documents will lead to consideration of their bid at par with other bidders. No benefits shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or attested by a Gazetted officer
30	**Integrity Pact (IP) — Independent external monitors (IEM)** For tenders in which integrity pact is applicable, following points stand valid :
A	IP is a tool to ensure that activities and transactions between the company and its bidders / contractors are handled in a fair, transparent and corruption free manner. A panel of Independent External Monitors (IEMs) have been appointed to oversee implementation of IP in BHEL. The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory who signs in the offer) along with techno commercial bid. Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this pact would be a preliminary qualification. Name : ---------- Address : ---------- } As indicated in NIT / enquiry :201__ mail : ----------
B	Please refer section 8 of the IP for roles and responsibilities of IEMs. In case of any complaint arising out of tendering process, the matter may be referred to the IEM mentioned in the tender. **NOTE:** No routine correspondence shall be addressed to the IEM (phone / post / e-mail) regarding the clarifications, time extensions or any other administrative queries, etc. on the tender issued. All such clarifications / issues shall be addressed directly to the tender issuing (procurement) department.
31	**Fraud Prevention Policy** : The Bidder along with its associate / collaborators / sub-contractors / sub-vendors / consultants / service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.
32	GSTN nos. of vendors as well as GSTN No of BHEL must be mentioned on the invoices/bills of the materials. Please note that correct HSN code as well as rate of GST be mentioned in the invoice/bills.
33	BHEL FSIP GSTIN Reg. No: 09AAACB4146P2ZC State Code: 09 (Uttar Pradesh)

34	**(a) Right of Acceptance**: BHARAT HEAVY ELECTRICALS LIMITED JAGDISHPUR reserves the right to reject any or all the bids/quotations without assigning any reason thereof. BHEL also reserves the right to increase or decrease the tendered quantities. Bidders should be prepared to accept order for reduced quantity without any extra charges. **(b) Right of Rejection /Non- Placement of PO**: BHEL reserves the right to accept the offers in part or in full or cancel the Tender enquiry/PO without assigning any reason. **(c)** Wherever BHEL business interest will contradict with any supplier, offer of that supplier may be rejected.
35	**Integrity Commitment:** The offers of the bidders who are under suspension as also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL website www.bhel.com. Integrity commitment, performance of the contract and punitive action thereof :
A	**Commitment by BHEL :** BHEL commits to take all measures necessary to prevent corruption in connection with the tender process and execution of the contract. BHEL will during the tender process treat all bidder's in a transparent and fair manner, and with equity.
B	**Commitment by bidder / Supplier / Contractor :** - The bidder / supplier / contractor commit to take all measures to prevent corruption and will not directly or indirectly influence any decision or benefit which he is not legally entitled to nor will act or omit in any manner which tantamount to an offence punishable under any provision of the Indian Penal code, 1860 or any other law in force in India. - The bidder / supplier / contractor will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to relevant guidelines issued from time to time by govt. of India / BHEL - The bidder / supplier / contractor will perform / execute the contract as per the contract terms & conditions and will not default without any reasonable cause, which causes loss of business / money / reputation to BHEL.
C	If any bidder / supplier / contractor during pre-tendering / tendering / post tendering / award / execution / post execution stage indulges in mal-practices, cheating, bribery, fraud or / and other misconduct or formation of cartel so as to influence the bidding process or influence the price or acts or omits in any manner which tantamount to an offence punishable under any provision of the Indian Penal Code, 1860 or any other law in force in India, then action may be taken against such bidder / supplier / contractor as per the extant guidelines of the company available on www.bhel.com and / or under applicable legal provisions.
d	Defaulter suppliers shall be treated as per Guidelines for Suspension of the Business Dealing with suppliers/contractors.
36	**Deviation**: Any of the terms and conditions not acceptable to supplier, shall be explicitly mentioned in the tender. Otherwise, it will be treated as that all those terms and conditions as mentioned in the tender are acceptable in Toto.
37	**Benefits earmarked to suppliers for Purchase under ' MAKE IN INDIA'**
	Compliance to **MAKE IN INDIA** circular issued by GOI: "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 04.06.2020 issued by DPIIT. In case of subsequent orders issued by the nodal ministry, changing the definition of local content for 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" (Format Attached).
	As part of minimizing import content, Government of India, vide order no P-45021/2/2017-B.E.-II dated 15.06.2017, under the subject – Public Procurement (Preference to Make in India) -- has set the initiatives to encourage and promote indigenously manufactured goods within India and services provided by sources within India. . In line with this, bidders who manufacture the goods and provide services within India (otherwise referred as local suppliers) are given purchase preference and are entitled to benefits in the tender
A	Definitions
(i)	Local content means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value , in percent . Presently, the minimum local content required is

	50%. The nodal ministry may prescribe a higher or lower percentage in respect of any particular item and may also prescribe the manner of calculation of local content.
(ii)	Local supplier means a supplier or service provider whose product or service offered for procurement meets the minimum local content as prescribed
(iii)	Margin of Purchase Preference means the maximum extent to which the price quoted by a local supplier may be above the L1 for the purpose of purchase preference. Presently the margin of Purchase preference is 20%.
B	Conditions under which preference is given
(i)	In procurement of goods in respect of which the Nodal ministry has communicated that there is sufficient local capacity and local competition, and where the estimated value of procurement is Rs 50 lakhs or less, only local suppliers shall be eligible. If the estimated value of procurement of such goods is more that Rs 50 lakhs, provisions of 37(B) (ii) and 37(B)(iii) shall apply.
(ii)	If the procurement of goods are not covered by 37(B)(i) and are divisible in nature, the following procedure shall be followed :
a	If L1 is a local supplier, the order for full quantity shall be awarded to local supplier
b	If L1 bid is not from a local supplier, 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the local suppliers, shall be invited to match the L1 price for the remaining 50% quantity, subject to the local supplier's quoted price falling within the margin of purchase preference, and the order for that quantity shall be awarded to such local supplier subject to matching the L1 price. In case such lowest eligible local supplier fails to match the L1 price or accepts less than offered quantity, the next higher local supplier within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on, and the order shall be awarded accordingly. In case some quantity is still left uncovered on local suppliers, then such balance quantity may also be ordered on the L1 bidder.
iii	If the procurement of goods are not covered by 37(B)(ii) and are not divisible in nature, and in procurement of services where the bid is evaluated on the price alone, the following procedure shall be followed :
a	If L1 is a local supplier, the order shall be awarded to local supplier
b	If L1 bid is not from a local supplier, then the lowest bidder among the local suppliers, will be invited to match the L1 price, subject to the local supplier's quoted price falling within the margin of purchase preference, and the order shall be awarded to such local supplier subject to matching the L1 price. In case such lowest eligible local supplier fails to match the L1 price, the local supplier with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on, and the order shall be awarded accordingly. In case none of the local suppliers within the margin of preference match the L1 price, then the order may be awarded to the L1 bidder.
C	Exemption of small purchases
	Notwithstanding anything contained at clause 37B above**, procurements** where the estimated value of procurement is less than Rs 5 lakhs are **exempt and** purchase preference shall not be accorded in such cases.
D	Verification of local content
(i)	The local supplier, at the time of tender, bidding or solicitation, shall be required to provide self-certification that the item offered meets the minimum local content and shall give details of the location(s) at which the local value addition is made.
(ii)	In cases of procurement for a value in excess of Rs 10 crores, the local supplier shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.

(iii)	False declarations shall be in breach of code of integrity and shall invite action as per guidelines for Suspension of Business dealings with Suppliers
E	In case of any disputes / clarifications, the extant guidelines of Government of India shall prevail.
38	**Model Clauses for Tenders**
I	Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority.
II	"Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.
III	"Bidder from a country which shares a land border with India" for the purpose of this Order means: -
a	An entity incorporated, established or registered in such a country: or
b	A subsidiary of an entity incorporated, established or registered in such a country; or
c	An entity substantially controlled through entities incorporated, established or registered in such a country; or
d	An entity whose beneficial owner is situated in such a country; or
e	An Indian (or other) agent of such an entity; or
f	A natural person who is a citizen of such a country; or
g	A consortium or joint venture where any member of the consortium or joint venture falls under any of the above
IV	The beneficial owner for the purpose of (iii) above will be as under:
1	In case of a company or limited liability Partnership, the beneficial owner is the natural person (s) who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means. Explanation –
A	"Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent. Of shares or capital or profits of the company
B	"Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholder's agreements of voting agreements;
2	In case of a partnership firm, the beneficial owner is the natural person (s) who, whether acting alone or together, or through one or more juridical of capital or profits of the partnership;
3	In case of an unincorporated association or body of individuals, the beneficial owner is the natural person (s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property of capital of profits of such association or body of individuals;
4	Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
5	In case of trust, the identification of beneficial owner (s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.
V	An agent is a person employed to do any act for another, or to represent another in dealings with third person.
39	**Conciliation**
	BHEL and bidder agree that if at any time (whether before, during or after the arbitral or judicial proceedings), any disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the terms & conditions of order, which the parties are unable to settle mutually), arise inter-se the parties, the same may, be refereed by either party to Conciliation to be

	conducted through Independent Experts Committee to be appointed by competent authority of BHEL from the BHEL panel of Conciliators Notes: 1. No serving or a retired employee of BHEL/Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators. 2. Any other person(s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof. The details of Conciliations shall be governed by the BHEL Conciliation scheme 2018.
40	**Clause for Suspected Cartel Formation**
	The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). 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, suitable action shall be taken by BHEL as per extant policies/ guidelines.
41	*Important Note: The bidder will, when presenting his bid, declare whether other family firms or sister concern affiliates/subsidiary firms are participating in same tender, so as to eliminate the possibility of cartel formation. Format for declaration is attached.*
42	**Submission of Performance Security for execution of the contract**
	Bidder agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of performance security, enhanced performance security which would include interest (SB/ rate + 6%) for the delayed period, shall be submitted by the bidder. Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms defined in NIT I contract, from the bills along with due interest.
43	**If supplier does not mention against any terms of "General Terms and conditions", "Special/supplementary terms and conditions" and NIT terms. It shall be summarily concluded that respective terms are acceptable to supplier and no further clarification shall be asked.**

PREFERENCES/BENEFITS FOR MSEs:

Following preferences/benefits shall be given to MSEs in line with Public procurement policy for Micro and Small Enterprises (MSEs), 2012:

1. The tender documents shall be issued free of cost to MSEs.

2. MSEs are exempted from payment of Earnest Money Deposit (EMD).

3. In tender, Micro and Small Enterprises quoting within the price band of L1+15% shall be allowed to supply the requirement up to 25% of the tender quantity subject to condition that such Enterprises bring down their price to L1 price where L1 price is from other than a Micro and Small Enterprise. If L1 offer is from a Micro / Small Enterprise, this provision will not be applicable. In case more than one Micro and Small Enterprise is there within this span, the supply shall be shared proportionately to the tender quantity. For availing the advantage of L1+15%, bidder to provide the MSME certificate prior to price bid opening.

   Under above following provision is categorised as below:

   - **Special provision for Micro and small enterprises owned by SC or ST**: -

   Sub target of 25% (i.e. 6.25% out of 25%) would be earmarked for procurement from Micro and Small Enterprises owned by the Scheduled Caste or Scheduled Tribe Entrepreneurs provided that in event of failure of such Micro and Small Enterprises to participate in the tender process or meet the tender requirements and the L1 price, the 6.25% sub-target for procurement ear-marked MSE owned by Scheduled Caste or Scheduled Tribe Entrepreneurs shall be met from other MSE Enterprises.

   - **Special provision for Micro and small enterprises owned by Women in following cases**: - 3% reservation for women owned MSEs under following conditions
     i. In case of Proprietary MSE, proprietor is woman.
     ii. In case of partnership MSE, the woman partner is holding at least 51% share in the unit.
     iii. In case private limited companies, at least 51% share is held by woman promoters.

MSE suppliers can avail the intended benefits only if they submit along with offer, attested copies of either EM-II certificate having deemed validity (Five years from date of issue of acknowledgement in EM-II) or valid NSIC certificate/ DIC certificate/ Udyog aadhar or EM-II certificate along with attested copy of a CA certificate (format enclosed as per annexure-I where deemed validity of EM-II certificate of 5 years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (part-I in case of two part bid). Non submission of such documents will lead to consideration of their bids at par with other bidders. MSE status of such suppliers shall be shifted to non MSE supplier till the supplier submits the documents. This provision for MSE will apply subject to the condition that the participating MSE meets the tender requirements.

ANNEXURE- I

Certificate by Chartered Accountant on Letter Head

This is to Certify that M/s. .....(Hereinafter referred to as 'company') having its registered office at .....is registered under MSMED Act 2006, (Entrepreneur Memorandum No (Part-II .....dated: ..... Category: ..... (Micro/Small) (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as on date ..... as per MSMED Act 2006 is as follows:

I. For Manufacturing Enterprises: Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated October 5, 2006 :

Rs. .....Lacs

2. For Service Enterprises: Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:

Rs .....Lacs

(Strike off whichever is not applicable)

The above investment of Rs. ..... Lacs is within permissible limit of Rs. ----------Lacs for ..... Micro/Small (Strike off which is not applicable) Category under MSMED Act 2006.

Or

The company has been graduated from its original category (Micro/ Small) (Strike off which is not applicable) and the date of graduation of such enterprise from its original category is ----------(dd/mm/yyyy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S.O. No. 3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:

(Signature)

Name -

Membership number -

Seal of Chartered Accountant

DECLARATION BY VENDOR

We declare that the following family firms or sister concern affiliates/subsidiary firms are participating in the tender No ……

1. ……

2. ……

3. ……

……

I ……., hereby declare on behalf of M/s ……. and the family firms or sister concern affiliates/subsidiary firms listed above that we are not indulging in cartel formation for enquiry No ……..

(……)

For M/s ……

(Seal & Sign)

Self-Declaration on Class I/Class II/Non Local under Make in India

(Valid for tender value greater than or equal to 5 Lakhs and Less than or equal to 10 Crores)

I ……., hereby declare on behalf of M/s ……. that my firm is under Class I ( )/Class II ( ) /Non Local ( ) as per Make in India Government Preferences.

(……)

For M/s ……

(Seal & Sign)

Annexure-1

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for entering into a framework agreement / Rate Contract for supply of paint / Primer / Thinner TE-136/2022-23 (hereinafter referred to as "Contract"). The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint panel of Independent External Monitor(s) (IEMs), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles: -

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. The Bidder(s)/ Contractor(s) commits himself to observe the following principles during participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. 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.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and shall await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process , terminate the contract, if already awarded, exclude from future business dealings and/ or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - Compensation for Damages

4.1 If the Principal has disqualified the Bidder (s) from the tender process before award / order acceptance according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.

4.2 If the Principal is entitled to terminate the Contract according to Section 3, or terminates the Contract in application of Section 3 above , the Bidder(s)/ Cotractor (s) transgression through a violation of Section 2 above shall be construed breach of contract and the Principal shall be entitled to demand and recover from the Contractor an amount equal to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee , whichever is higher, as damages, in addition to and without prejudice to its right to demand and recover compensation for any other loss or damages specified elsewhere in the contract.

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 (three) years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason or action can be taken as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 6 - Equal treatment of all Bidder (s)/ Contractor (s) / Sub-contractor (s)

6.1 The Principal will enter into Integrity Pacts with identical conditions as this Integrity Pact with all Bidders and Contractors.

6.2 In case of Sub-contracting, the Principal Contractor shall take the responsibility of the adoption of Integrity Pact by the Sub-contractor(s) and ensure that all Sub-contractors also sign the Integrity Pact.

6.3 The Principal will disqualify from the tender process all Bidders who do not sign this Integrity Pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 -Independent External Monitor(s)

8.1 The Principal appoints competent and credible panel of Independent External Monitor (s) (IEMs) for this Integrity Pact. The task of the IEMs is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Integrity Pact.

8.2 The IEMs are not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The IEMs shall be provided access to all documents/ records pertaining to the Contract, for which a complaint or issue is raised before them as and when warranted. However, the documents/records/information having National Security implications and those documents which have been classified as Secret/Top Secret are not to be disclosed.

8.4 The Principal will provide to the IEMs sufficient information about all meetings among the parties related to the Contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the IEMs the option to participate in such meetings.

8.5 The advisory role of IEMs is envisaged as that of a friend, philosopher and guide. The advice of IEMs would not be legally binding and it is restricted to resolving issues raised by a Bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some Bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.

8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process or during execution of Contract, the matter should be examined by the full panel of IEMs jointly, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.

8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to the CMD, BHEL at the earliest. They may also send their report directly to the CVO, in case of suspicion of serious irregularities requiring legal/ administrative action. Only in case of very serious issue having a specific, verifiable Vigilance angle, the matter should be reported directly to the Commission. IEMs will tender their advice on the complaints within 30 days.

8.8 The CMD, BHEL shall decide the compensation to be paid to the IEMs and its terms and conditions.

8.9 IEMs should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the Prinicpal should be looked into by the CVO of the Principal.

8.10 If the IEMs have reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code / Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the IEMs may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 After award of work, the IEMs shall look into any issue relating to execution of Contract, if specifically raised before them. As an illustrative example, if a Contractor who has been awarded the Contract, during the execution of Contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs. Issues like warranty/ guarantee etc. shall be outside the purview of IEMs.

8.12 However, the IEMs may suggest systemic improvements to the management of the Principal, if considered necessary, to bring about transparency, equity and fairness in the system of procurement.

8.13 The word `Monitor' would include both singular and plural.

Section 9 - Pact Duration

9.1 This Integrity Pact shall be operative from the date this Integrity Pact is signed by both the parties till the final completion of contract for successful Bidder, and for all other Bidders 6 months after the Contract has been awarded. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.

9.2 If any claim is made/ lodged during currency of this Integrity Pact, the same shall be binding and continue to be valid despite the lapse of this Pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

10.1 This Integrity Pact is subject to Indian Laws and exclusive jurisdiction shall be of the competent Courts as indicated in the Tender or Contract, as the case may be.

10.2 Changes and supplements as well as termination notices need to be made in writing.

10.3 If the Bidder(s)/ Contractor(s) is a partnership or a consortium or a joint venture, this Integrity Pact shall be signed by all partners of the partnership or joint venture or all consortium members.

10.4 Should one or several provisions of this Integrity Pact turn out to be invalid, the remainder of this Integrity Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders / contractors who have entered into this Integrity Pact with the Principal would be competent to participate in the bidding. In other words, entering into this Integrity Pact would be a preliminary qualification.

10.6 In the event of any dispute between the Principal and Bidder(s)/ Contractor(s) relating to the Contract, in case, both the parties are agreeable, they may try to settle dispute through Mediation before the panel of IEMs in a time bound manner. In case, the dispute remains unresolved even after mediation by the panel of IEMs, either party may take further action as the terms & conditions of the Contract. The fees/expenses on dispute resolution through mediation shall be shared by both the parties. Further, the mediation proceedings shall be confidential in nature and the parties shall keep confidential all matters relating to the mediation proceedings including any settlement agreement arrived at between the parties as outcome of mediation. Any views expressed, suggestions, admissions or proposals etc. made by either party in the course of mediation shall not be relied upon or introduced as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the dispute that is the subject of mediation proceedings. Neither of the parties shall present IEMs as witness in any Alternative Dispute Resolution or judicial proceedings in respect of the dispute that was subject of mediation.

24/01/2023

For & On behalf of the Principal
(Office Seal)

For & On behalf of the Bidder/ Contractor
(Office Seal)

Place Jagdishpur
Date 24/01/2023

Witness: PKTripathi
(Name & Address) Prashant Kr. Tripathi
BHEL FSSP. Jagdishpur
Distt. Amethi (UP)

Witness:
(Name & Address)

Clause on IP in the tender

Integrity Pact (IP)

(a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

SI	IEM	Email
1.	Shri Otem Dai, IAS (Retd.)	iem1@bhel.in
2.	Shri Bishwamitra Pandey, IRAS (Retd.)	iem2@bhel.in
3.	Shri Mukesh Mittal, IRS (Retd.)	iem3@bhel.in

(b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/ three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

(c) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through email only.

Note:

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:

Details of contact person(s):

(1)
Name: Manmeet Kumar
Deptt: MM
Address: FSIP Jagdishpur
Phone: (Landline/ Mobile)
8427978877
Email: manmeet@bhel.in
Fax:

(2)
Name: N. A. Saifi
Deptt: MM
Address: FSIP Jagdishpur
Phone: (Landline/ Mobile)
7318492175
Email: nasaifi@bhel.in
Fax:

RUST PREVENTIVE HARD FILM, BLACK (TRP)

1 GENERAL

This specification governs the quality requirements of temporary rust preventive (TRP), coating a hard film on drying. The material consists of film forming ingredients dissolved in solvents to give a low viscous liquid at room temperature. On evaluation of solvents, a thin though abrasion resistant film capable of being handled without damage shall be obtained.

Normally this material gives protection upto six months and thereafter requires inspection and reapplication, if necessary.

2 APPLICATION

Depending upon components and their sizes, the rust preventive can be applied by brush, dip or spray. Two liberal coats are desirable for adequate protection. The surface to be coated with anti-rust solution should be absolutely clean and free from rust.

3 REMOVAL

This TRP can be removed by cotton cloth soaked in white spirit to BHEL specification AA56701.

4 COLOUR

Steel Black

5 COMPLIANCE WITH NATIONAL STANDARDS

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

IS: 1153 - 2000: Temporary Corrosion Preventive, Fluid, Hard Film, Solvent deposited

6 COMPOSITION

The composition shall be based on asphalt, mineral oil and inhibitive pigments with suitable additives.

7 TEST SAMPLES

Half a litre of sample shall be taken for testing and approval.

8 PROPERTIES

When tested in accordance with the relevant clauses of BHEL standard AA0850001, the test sample shall show the following properties:

8.1 Consistency

90 ± 10 seconds in Ford Cup No.4 at 27± 0.5°C

8.2 Drying Time

Tack free : Within one hour

Hard dry : 16 hours

8.3 Flash Point

32°C, min.

8.4 Weight

11 ± 0.5 kg per 10 litres

8.5 Non-volatile Matter

58 ± 2% by mass

8.6 Test for Adhesion

To pass the test

8.7 Spreading Capacity

8.0 sq.meter/litre, minimum

8.8 Protection against corrosion at high temperature and humidity

To pass the test for 360 hours, minimum.

9 TYPE TESTS

Whenever specified, the following tests shall be carried out, as per the methods mentioned against each.

i) Protection against corrosion under conditions of condensation (IS: 101 Part 6/Sec 1)
No sign of corrosion on the surface after 21 days of exposure.

10 TEST CERTIFICATES

Three copies of test certificates shall be supplied along with each consignment, giving the following information:

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

- AA55154, Rev. 03: RUST PREVENTIVE HARD FILM, BLACK (TRP)
- BHEL Order No.
- Batch / Lot No.
- Supplier's/ Manufacturer's Name and Trade mark, if any
- Date of manufacture and expiry
- Test results of clause 8 and 9.

11 KEEPING PROPERTY

When stored in a covered dry place in the original sealed containers under normal temperature conditions, the material shall retain the properties prescribed in this specification for a period of not less than 12 months after the date of manufacture which shall be subsequent to the date of placing the order.

12 PACKING & MARKING

Unless otherwise specified, the material shall be supplied in 4 kg steel containers, which shall be leak free, dry and clean.

Each container shall marked with the following information:

– AA55154: RUST PREVENTIVE HARD FILM, BLACK (TRP)
– BHEL Order No.
– Supplier's / Manufacturer's Name and Trade mark, if any
– Batch No. /Lot No.
– Date of manufacture and expiry
– Quantity supplied

13 ENVIRONMENTAL REQUIREMENTS

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

14 REFERRED STANDARDS (Latest Publications Including Amendments)

1) AA0850001
2) AA56701
3) IS: 101, Part 6, sec 1

ANTI-CORROSIVE PRIMING PAINT

1.0 GENERAL:

This specification governs the quality requirements of air drying Anti Corrosive ready mixed Red oxide Zinc phosphate priming paint which shall be capable of being brushed, sprayed by conventional methods. The priming paint shall be suitable to be thinned with MTO/white spirit conforming to BHEL specification AA56701.

The paint shall be compatible with high quality full glossy outdoor finishing paint to BHEL specification AA56126 (IS: 2932 Part 1), when surfaces primed with this paint are coated with 2 coats of finishing paint.

2.0 APPLICATION:

The material shall be intended for use as a primer coat in the painting system for protection of steel surfaces against corrosion for outdoor and indoor application on Electrical equipment. Normally, for best performance the surface to be coated shall be ensured free from oil, loose rust/dust etc., followed by blast cleaning to Sa 2 1/2.

This shall be followed by application of two coats of the priming so as to achieve dft of 30 microns, min.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

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

IS:12744 (Part: 1): 2013: Ready Mixed Paint, Air Drying, Red Oxide-Zinc Phosphate Priming-Specification.

4.0 COLOUR: The colour of the material shall be that of red oxide.

5.0 FINISH: Smooth and Matt to Egg shell flat

6.0 FREEDOM FROM DEFECTS:

The priming paint shall remain free from defects like hard settling of pigments, thick and hard skinning etc., when kept in closed container and livering (excessive viscosity build up) during its rated shelf life.

The dried surface of the coating shall be smooth, uniform, homogenous appearance and shall be free from physical defects like, pinholes, wrinkles, hard particles, blisters, air bubbles etc.

7.0 CHEMICAL COMPOSITION:

The paint shall be formulated with anti-corrosive pigments like Red oxide of iron, Zinc phosphate, extenders etc., dispersed in unsaponifiable modified alkyd medium in solvent,

thinner and drier in suitable proportions so as to satisfy the requirements prescribed in this specification. The raw materials used in the formulation of the priming paint shall be of good quality and conform to following Indian standards.

a) Zinc Phosphate : IS: 10897

b) Red Oxide of Iron : IS: 44

c) Oil or turpentine

d) Petroleum hydrocarbon solvent : IS: 1745

e) Liquid drier : IS: 8766

The supplier of the material has to certify that the paint supplied shall be free from lead or its compounds and also meets the legislative requirements of ISO 14001.

8.0 TEST SAMPLES AND TEST METHODS

Tender samples will not be required when once the type approval is given and the supplier concerned declared that the material for which the tender is given of the same quality as the type approved sample.

500ml of thoroughly mixed sample representing lot be drawn from randomly selected drum and shall be sent to laboratory for testing. The testing shall be done in accordance with relevant part and section of IS: 101 or as specified in this specification.

9.0 PROPERTIES:

9.1. Drying Time

Surface dry : 2 hours, maximum

Hard dry : 18 hours, maximum

9.2. Consistency

Smooth and uniform and suitable for brushing without appreciable drag on the brush or spraying as required.

Efflux time by Ford cup No. 4, at 27 ± 2°C: 80 - 120 secs.

9.3. Mass per Ten Litres:

13.5 kgs. ± 3 %

9.4. Flash Point:

30°C, min

9.5. Scratch Hardness:

When tested on coated panels air dried for 48 hrs and tested at a load of 1500g on steel panels and 1000g on tinned mild steel panels, no such scratch as to show the bare metal shall be produced.

9.6. Flexibility and Adhesion:

When tested on coated panels air dried for 48 hrs, no visible damage or detachment of coating shall take place and passes the test when tested by cylindrical bend test method.

9.7. Resistance to Salt Spray:

When tested as per test method of IS 2074 Part 1, the test panel prepared from the followed by air drying for 48 hrs, material shall show no sign of corrosion after continuous exposure for 96 hrs, in salt spray cabinet.

9.8. Protection against Corrosion under Conditions of Condensations:

The coated panels air dried for 48 hrs, are subjected to continuous exposure, shall show no sign of deterioration of the coating & metal surface show no sign of corrosion.

9.9. COMPOSITION:

9.9.1. Pigment Content: 50 ± 5% by mass

9.9.2. Zinc Phosphate (IS 10897): 16.0%, min. by mass on pigment

9.9.3. Red Oxide AS Fe_2O_3 (IS 44): 50.0%, min. by mass on pigment

10.0 VOLUME SOLIDS: 40.0% min. (Pigment + Binder) by weight.

11.0 COMPATIBILITY TEST WITH COATS:

The primer paint shall be fully compatible with top coats like, High quality full glossy finishing paint conforming to AA56126 /IS 2932 Part 1, when tested as per method prescribed in Annexure-1.

12.0 WET OPACITY (FOR INFORMATION ONLY):

Theoretical coverage: 10 sq.m / litre @ dft: 35 microns.

13.0 TEST CERTIFICATES:

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

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

The test certificates shall bear the following information:
AA56101 Rev. No. 08 - ANTI-CORROSIVE PRIMING PAINT

BHEL order:

Supplier's Name and address

Identification/Trade Mark, if any.

Batch No/Lot No.:

Date of Manufacture and Expiry.

Lot Quantity:

Test results of clause 7.0 to 12.0.

Special Instructions, if any.

CORPORATE PURCHASING SPECIFICATIONS

14.0 KEEPING PROPERTY:

When the material stored in a covered dry place in the original sealed container at under ambient conditions, the same shall retain the properties prescribed in this specification for a period of at least 12 months after the date of manufacture, which shall not be subsequent to the date of placing the order and not earlier than one month of the scheduled delivery date mentioned in BHEL order.

15.0 ENVIRONMENTAL REQUIREMENTS:

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply. Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

16.0 PACKING & MARKING:

Unless otherwise stated, the paint shall be supplied in packing size as specified in BHEL order and shall be packed in air tight leak -proof metal container conforming to IS: 1407 and IS: 2552. Each container shall bear following information neatly written or pasted on the container.

AA56101 - ANTI-CORROSIVE PRIMING PAINT

BHEL order:

Name of supplier and address:

Identification/Trade Mark, if any.

Quantity of material:

Batch No/Lot No.:

Date of Manufacture and Expiry.

Special Instructions, if any:

17.0 REFERRED STANDARDS (Latest Publications Including Amendments)

1) IS: 44
2) IS : 101
3) IS : 1407
4) IS : 1745
5) IS : 2074
6) IS : 2552
7) IS: 2932 : Part 1
8) IS: 10897
9) IS : 12744
10) IS : 13262
11) ASTM D 3359
12) AA56126
13) AA56701
14) IS: 8766

ANNEXURE-I

TEST FOR COMPATIBILITY OF ANTI-CORROSION PRIMING PAINT (AA 56101) WITH TOP COATS OF FINISHING PAINT (AA56126/IS 2932 : Part 1)

The compatibility of anti- corrosive priming paint conforming to AA 56101 with top coat finishing paint to AA56126/IS 2932 : Part 1, shall be checked by Cross-cut tape adhesion method prescribed in ASTM D 3359. The adhesion tape used shall conform to IS 13262 or any other tape bearing ISI mark having sufficient adhesion strength.

A Steel plate of size 150x100mm is taken for testing compatibility. Thoroughly clean the plate with emery to make it free from rust, oil, dust etc. Apply two coats of homogenized anticorrosive priming paint after allowing coating to dry over night before, application of next coat.

Apply two coats of top coat finishing paint evenly covering plate completely. Allow the coatings, to dry for 48 hours at ambient conditions before performing the cross cut adhesion test.

Test method B shall be followed and the acceptance criteria shall be 4 B, i.e., small flakes of the coating material are detached at intersections and less than 5% of the area is affected

CHEMICAL RESISTANT EPOXIDE RED OXIDE ZINC PHOSPHATE PRIMING PAINT

1 GENERAL

This specification deals with the quality requirements of two pack Chemical resistant Epoxy Based Priming Paint pigmented with Red Oxide Zinc Phosphate.

2 APPLICATION

The paint shall be used as a primer in the painting system for protection of steel work, both under marine and inland outdoor conditions.

3 COMPLIANCE WITH NATIONAL STANDARDS

The material shall comply, in general, with the following national standards and also meet the requirements of this specification

IS 14506 : 1998 : Epoxy red oxide zinc phosphate weldable primer, two component

4 COMPOSITION

The paint consists of two components i.e. base and accelerator. The base contains epoxy binder suitably pigmented with red oxide and zinc phosphate and extenders. The accelerator is polyamide and solvent to cure the base of the paint system.

5 MIXING RATIO

The components of paint are to be mixed as recommended in the product data sheet supplied by the manufacturer of the paint: The type and content of the binding material as determined by infrared spectroscopy or thin layer chromatography shall be strictly adhered to the "Type approved sample".

6 COLOUR

Red oxide.

7 FINISH

Smooth and matt.

8 FREEDOM FROM DEFECTS

The base of the paint system shall remain free from defects like hard setting of pigments, skinning and livering when kept in closed container till its shelf life.

9 SAMPLING

As per IS 101.

10 TECHNICAL REQUIREMENTS

Unless otherwise specified, the sample (mixed paint) shall be tested in accordance with IS 101.

10.1 Mass per 10 litres

12 kg, minimum

10.2 Consistency

Paint shall be mixed so that it produces a smooth and uniform paint suitable for application.

40 - 60 secs by FC No.4 at 27± 2°C.

10.3 Drying time

a) Soft dry : 4 hours, maximum

b) Hard dry : 16 hours, maximum

10.4 Volatile matter, percent by mass

30, maximum

10.5 Pigment content, percent by mass

40, minimum.

10.6 Volume solids, percent

35, minimum.

10.7 Dry film thickness per coat

25 microns, minimum.

10.8 Flash point

20°C, minimum.

10.9 Pot life at ambient temperature (Annexure-A)

4 hours, minimum.

10.10 Zinc phosphate, percent by mass on pigment (Annexure-B)

16 percent by mass, minimum.

10.11 Scratch Hardness (IS 101 : Part 5 : Sec 1)

After the film is cured for 7 days and tested under of 2000gm, no such scratch as to show the bare metal shall be produced.

10.12 Flexibility and Adhesion (IS 101 : Part 5 : Sec 2)

The film shall not show sign of damage detachment or cracking when tested after 4 days of curing.

10.13 Type Test

Salt spray test for 300 hours (IS 101 : Part 6 : Sec 1):

The test panel prepared from this material shall show no signs of corrosion after continuous exposure for 300 hours in salt spray cabinet.

11 TYPE APPROVAL

Samples

Samples for type approval testing shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory to ensure continuous supply of good product.

12 TEST CERTIFICATES

Unless otherwise stated, three copies of test certificates shall be supplied along with each consignment giving following information:

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

AA56105, Rev.07: CHEMICAL RESISTANT EPOXIDE RED OXIDE ZINC PHOSPHATE PRIMING PAINT

BHEL Order No.

Manufacture's/Supplier's Name and Trade mark, if any.

Batch/Lot No.

Quantity supplied

Date of manufacture and Expiry

Test results of clause 10

Mixing Ration

13 KEEPING PROPERTY

When stored in covered dry place in the original sealed containers under normal temperature conditions, the material shall retain the properties prescribed in this specification for a period of 12 months after the date of manufacture, which shall be subsequent to the date of placement of BHEL order.

14 PACKING AND MARKING

Unless otherwise stated, base and hardener shall be packed separately in steel containers of approximate capacities. Each container shall bear the following information:

AA56105: CHEMICAL RESISTANT EPOXIDE RED OXIDE ZINC PHOSPHATE PRIMING PAINT

BHEL Order No.

Batch / Lot No.

Supplier's/ Manufacturer's Name and Trade mark, if any

Name of components

Mixing ration

Date of manufacture and expiry

Quantity supplied

15 REFERRED STANDARDS (Latest Publications Including Amendments)

1) IS 101 : Part 5 : Sec 1
2) IS 101 : Part 5 : Sec 2
3) IS 101 : Part 6 : Sec 1
4) IS 101

Annex A (Cl 10.9)

PROCEDURE FOR TESTING OF POT LIFE

If the mixed paint, as recommended by the supplier, could be still thinned, the end of the working life (pot life) has not been reached. The end of the working life is reached when the test material (paint) gels, becomes stringy or cannot be thinned for application. The time interval between the mixing time and time of gelling shall be reported as pot life of the mixed paint.

ANNEXURE - B (Cl 10.10)

PROCEDURE FOR TESTING OF ZINC PHOSPHATE CONTENT

A.1 General

The pigment is extracted from the paint and pigment is taken for the determination of Zinc phosphate content.

A.2 Reagents required

A.2.1 Quinoline solution

50ml of quinoline is dissolved in 60ml of hydrochloric acid and 30ml of water with constant stirring. The solution is cooled and filtered. This is diluted to 1000ml and stored in a polythene bottle.

A.2.2 Citric molybdic acid reagent

54gm of pure molybdic acid and 12gm of sodium hydroxide are dissolved in 400ml of hot water. 60gm of citric acid and 140ml of hydrochloric acid are added to 200ml of water. Now molybdic acid solution is added with citric acid solution and is made upto1000ml. (The solution may be green or blue colour on its exposure to light). If necessary 0.5 percent potassium bromate solution is added until the green colour becomes pale. This solution is kept in a polyethylene bottle and stored in a dark place.

A.3 Procedure

1 gm of the sample is weighed into a 250ml beaker and 30ml of 1:1 nitric acid and 5ml of 1:1 hydrochloric acid is added. The content is boiled well and filtered and made up to 200ml. 50ml of aliquot is pipetted out into a 500ml conical flask and this is diluted to 100ml. 30ml of citric molybdic acid solution is added and boiled gently. 10ml of quinoline solution is added from burette with continuous swirling. (Add 3 to 4 ml drop wise and balance in steady stream).

The precipitate is filtered into a weighed Gooch crucible provided with glass fibre or filter paper previously dried at 250°C. The precipitate is washe d with water and dried at 250°C. The dried precipitate (quinoline phosphomolybdate is weighed and calculated for its weight by difference.

A blank determination is carried out in the same way as the determination but omitting the test solution.

Calculation

$$\%\ Zinc\ phosphate, by\ mass = \frac{(M1\ -\ M0)\ x\ 0.3816}{1 Mass\ of\ sample\ in\ gm.} \times 100$$

Where

M1 = mass of precipitate in gm obtained in sample

M0 = mass of precipitate in gm obtained in blank

CHEMICAL RESISTANT CHLORINATED RUBBER BASED PRIMING PAINT

1.0 GENERAL:

This specification deals with the quality requirements of Chemical resistant Chlorinated Rubber Based Priming Paint which shall be capable of being brushed or sprayed by suitably thinning with industrial toluol or xylol conforming to BHEL specification AA56702 or AA56703 respectively. The paint shall be compatible with the finish paint conforming to BHEL specification AA56136.

Note: Normally priming and finishing paints shall be obtained from the same supplier. However, this priming paint shall be compatible with chlorinated rubber based finishing paint supplied by any other supplier as per AA56136.

2.0 APPLICATION:

Used for protection of steel structures and equipment subjected to humid, marine and highly corrosive industrial atmosphere. However, the paint is not suitable for surfaces heated to above 65ºC and for water immersed surfaces heated to above 43ºC.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

There is no Indian standard covering this type of material.

4.0 COLOUR:

Grey or Red as specified in BHEL order.

5.0 FINISH:

Smooth and matt.

6.0 FREEDOM FROM DEFECTS:

The paint shall remain free from defects like hard setting of pigments, skinning when kept in closed container and livering (excessive viscosity build up) during its rated shelf life.

7.0 CHEMICAL COMPOSITION:

The paint shall be composed of good quality chlorinated rubber based resin modified by chemically inert plasticizers and antifungus additives. It should contain Zinc phosphate pigments and other good quality protective pigments and extenders.

8.0 TEST SAMPLES:

Tender samples will not be required when once type approval is given (Cl 10.0) and the supplier concerned declares that the material for which the tender is given is of the same quality as the type approved sample.

9.0 PROPERTIES:

When tested in accordance with the relevant clauses and parts of IS: 101 and IS: 6947, part II, the test samples shall show the following properties:

9.1 Flash Point:

Not below 25ºC

9.2 Mass per Ten Litres:

13.0 ± 0.5 kg

9.3 Drying time:

Surface dry : ½ hour, max.
Tack free : 8 hours, max.

9.4 Flexibility and Adhesion:

No visible damage or detachment of the film shall take place.

9.5 Protection against Corrosion under Conditions of Condensation:

The painted panel shall not show any sign of deterioration and the metal surface no sign of corrosion.

9.6 Pigment and Non-volatile Matter Content :

9.6.1 Total Solids:

55 ± 2% by mass

9.6.2 Zinc Phosphate:

16%, minimum by mass of total solids

9.7 Consistency:

60 ± 5 seconds in Ford cup No. 4 at 27 ± 2ºC

9.8 Spreading Capacity:

7 square metres minimum per litre

9.9 Scratch Hardness:

After the panel is air dried for 48 hours and tested under a load of 1000 g, no such scratch as to show the bare metal shall be produced.

10.0 TYPE APPROVAL:

10.1 Samples:

Samples for type approval testing shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory to ensure continuous supply of good products.

10.2 Type Tests:

Whenever specified, the following tests shall be conducted as per the methods mentioned against each.

10.2.1 Resistant to salt Spray:

The panel prepared from the material shall show no signs of corrosion after continuous exposure for 10 days in salt spray cabinet.

11.0 TEST CERTIFICATES

Unless otherwise stated, three copies of test certificates shall be supplied along with each consignment giving following information:

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

BHEL order

AA56107, Rev.03: Chemical resistant chlorinated rubber based priming paint

Manufacturers/suppliers Name:

Trade name/mark, if any:

Batch/Lot No.;

Quantity supplied:

Date manufacture and expiry:

Test results of clause 7.0, 9.0 and 10.0

12.0 KEEPING PROPERTY

When stored in covered dry place in the original sealed containers under normal temperature conditions, the material shall retain the properties prescribed in this specification for a period of 12 months after the date of manufacture which shall be subsequent to the date of placement of BHEL order.

13.0 PACKING AND MARKING

Unless otherwise stated, the paint shall be packed in 20 litres steel drums.

Each container shall bear the following information:

AA56107: Chemical resistant chlorinated rubber based priming paint

BHEL Order No.:

Manufacturers/ Supplier's name:

Trade name / mark, if any:

Batch/Lot No.:

Quantity supplied:

Date of manufacture and expiry:

14.0 REFRRED STANDARDS (Latest publications including amendments):

1. IS: 101 2. IS: 6947 3. AA56136 4. AA56702 5. AA56703

HIGH BUILD INTERMEDIATE EPOXY PAINT

1 GENERAL

This specification governs the quality requirements of cold cured two-pack high build intermediate epoxy paint suitable for application by brushing or spraying.

2 APPLICATION

This material shall be used as an intermediate coat on epoxy primed surfaces to provide high build up coating thickness so as to protect the steel and other equipment's against corrosion due to humidity, saline environment and corrosive atmosphere.

3 COMPLIANCE WITH NATIONAL STANDARDS

There is no national standard covering this material.

4 COLOUR

Dark brown

5 FINISH

Smooth and matt.

6 FREEDOM FROM DEFECTS

The components of the paint shall remain free from defects like hard settling of pigments, skinning when kept in closed container and livering (excessive viscosity build up) during its rated shelf life.

The dried surface shall be free from defects like bittyness, floating of pigments, wrinkles, orange peel, blisters , hard particles, pin holes etc.,

7 CHEMICAL COMPOSITION

The material shall be based on two components epoxy system and supplied as catalysed epoxy resin pigmented with MIO & TiO2 and polyamide as an accelerator or hardener for cold curing. The mixing ratio of base and accelerator shall be as per supplier's recommendations. The type and content of the binding material i.e., epoxy resin, as determined by infrared spectrography or thin layer chromatography shall be strictly same as that of "Type Approved Sample".

The supplier should provide IR-Spectrograph in support of above composition.

The supplier of the material has to certify that the paint supplied is free from natural resins and free from lead or its compound to meet requirements of ISO 14001.

8 TEST SAMPLE

Tender sample will not be required when once the type approval is given and the supplier concerned has to declare that the material for which the tender is given is of the same quality as the type approved sample.

Representative sample of the material shall be drawn and tested as per IS 101.

Revisions:
As per clause 44.4 a) of MOM of MRC-CPO+NM

APPROVED:
INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(CPO+NM)

Rev No.02	Amd No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue
Dt:01-09-2009	Dt:	Year:2021	HEEP, Haridwar	Corp.R&D	01-06-2001

9 PROPERTIES

Unless otherwise specified, when tested in accordance with relevant parts of IS 101, the test samples shall show the following properties:

9.1 Consistency

Smooth and homogenous.

9.2 Drying Time

Touch dry : 6 hours, max.

Hard dry : 12 hours, max.

9.3 Mass per ten litres

12.5-13.5 kgs.

9.4 Non-volatile matter

48 - 52% by weight.

9.5 Volume Solids

55%, min.

9.6 Resistance to salt spray

The panels prepared from the material shall show no sign of corrosion after continuous exposure to salt spray for a period of 7 days in the salt spray cabinet.

9.7 Flexibility & Adhesion

The film shall show no sign of damage, detachment or cracking when tested after 7 days curing at RT or 2 hours drying at 70 - 80°C after 24 hours air drying.

9.8 Scratch Hardness

The film shall show no sign of scratch so as to show the bare metal at a load of 1000 grams when tested after 7 days curing at RT or 2 hours drying at 70 - 80°C after 24 hours air drying.

9.9 Flash Point

Not below 25°C.

9.10 Dry film thickness

75-100 microns per coat as per BHEL standard AA0674105.

9.11 Pot life

4-6 hours, when mixed.

10 TEST CERTIFICATES

Unless otherwise stated, three copies of test certificates shall be supplied along with each consignments, giving the following information.

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

AA56112, Rev.02: HIGH BUILD INTERMEDIATE EPOXY PAINT

BHEL Order No.

Manufacture's/Supplier's Name and Trade mark, if any.

Batch/Lot No.

Date of manufacture and expiry

Test results of clause 7 to 9

T.C. No and date

Mixing ratio

11 KEEPING PROPERTY

When stored in covered dry place in the original sealed containers under normal temperature conditions, the material shall retain the properties prescribed in this specification for a period of six months after the date of manufacture which shall be subsequent to the date of placement of BHEL order.

12 PACKING AND MARKING

Unless otherwise stated, base & hardener shall be packed separately in steel containers of 4 litres capacity.

Each container shall bear the following information:

AA56112: HIGH BUILD INTERMEDIATE EPOXY PAINT

BHEL Order No.

Batch / Lot No.

Supplier's/ Manufacturer's Name and Trade mark, if any

Name of components

Mixing ratio

Quantity supplied

Date of manufacture and expiry

13 ENVIRONMENTAL REQUIREMENTS

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

14 REFERRED STANDARDS (Latest Publications Including Amendments)

1) IS 101
2) AA0674105

INORGANIC ETHYL ZINC SILICATE PRIMER

1 GENERAL

This specification prescribes the quality requirements and application procedure for two components, air-drying, Inorganic Zinc Ethyl Silicate priming paint. This priming paint when applied on steel structures provides excellent resistance to temperature, soil chemicals, salts, water, and chemical resistance under marine conditions and outside weather ability.

2 APPLICATION

The material shall be intended for use as a primer coat in the painting system on new steel structures internally and externally. Normally, for best performance, the surface to be coated shall be ensured free from oil, loose rust/dust etc., followed by blast cleaning to Sa 2 ½ min. with a surface profile of 35 to 50 microns. This shall be followed by application of single coat of the priming paint by spray method so as to achieve dry film thickness t of 65-75 microns. The surface profile after blasting shall be 20-35 microns.

3 COMPLIANCE WITH NATIONAL STANDARDS

The material shall comply with the requirements of following Indian standard and also, meet other requirements of this specification:

IS: 14946-2001, Main coat: Zinc Ethyl Silicate Primer, Two Components

4 COLOUR

The colour of the material shall be Grey.

5 FINISH

Smooth and Matt.

6 COMPOSITION

The material shall be two components moisture and self-cured Inorganic Ethyl Silicate Binder pigmented with zinc metal powder conforming to IS: 14355 and having a purity of 99% and particle size of 4-5 microns, in the recommended proportion. The coating of this material attains water resistance within 30 minutes of application and remains unaffected by rains, condensation or dew etc. The manufacturer shall specify the principal type of binder used.

The supplier of the material shall declare that components of paint supplied shall meet the legislative requirements ISO 14001.

7 MIXING RATIO

The components of paints are to be mixed in the proportion as recommended by supplier of the material.

8 TEST METHODS

Unless specified otherwise, tests shall be conducted as prescribed in relevant parts and section of Indian standard IS: 101 and IS: 14946. The test panels shall preferably be prepared on blast cleaned surface.

9 PROPERTIES

The material shall meet the following technical requirements:

9.1 DRYING TIME

– Surface dry : 15 minutes, max.

– Hard dry : 2 hrs. min.

– Time to topcoat : 24 hrs. min.

9.2 CONSISTENCY

The liquid component mixed with powder shall be suitable for application by spray as such or when thinned in the proportions at specified by the manufacturer.

9.3 FLASH POINT

Not below 15°C

9.4 MASS PER TEN LITRES

20 kgs., min.

9.5 VOLUME SOLIDS

60% , min.

9.6 POT LIFE OF MIX (ANNEXURE D OF IS: 14946)

4 hrs. min. at 30°C

9.7 DRY FILM THICKNESS

65-75 microns per coat when measured after 72 hrs. of curing.

9.8 RESISTANCE TO SALT SPRAY TEST (TYPE TEST)

The material shall pass resistance to salt spray test, when test panels cured for 72 hrs. are subjected to continuous exposure for 2000 hrs.

9.9 PROTECTION AGAINST CORROISION UDNER CONDITIONS OF CONDENSATION (TYPE TEST)

The material shall pass the test, when test panels cured for 72 hrs. are subjected to exposure at specified conditions for 2000 hrs.

9.10 HEAT RESISTANCE TEST

The film shall not show signs of cracking, blistering or flaking when coated test panels air-dried for 48 hrs., are kept at 400±10°C for 6 hrs followed by plunging in cold water-three cycles, min.

9.11 COMPOSITION

9.11.1 SOLID CONTENT

68%, min. by weight of mixed paint.

9.11.2 TOTAL METALLIC ZINC CONTENT (ANNEXURE B OF IS: 14946)

75%, min. by weight in non-volatile portion of the paint.

9.12 MUD-CRACKING TEST

The coating applied to dry film thickness of 120 microns minimum, shall not show any mud cracking when viewed under 10 X magnification.

9.13 SEDIMENTATION TEST

There shall not be any segregation of zinc powder form the base material within 2 hrs in the

mixed paint.

9.14 CURE TEST

The coated test panels air dried for 48 hrs shall pass the cure test when tested according to test procedure given in ASTM D 4752.

10 KEEPING PROPERTY

When stored in covered dry place in the original sealed containers under normal ambient conditions, the liquid portion shall not show thickening, curdling, gelling or hard caking and also retain the properties of mixed paint prescribed in this specification for a period of six months from date of delivery.

11 TEST CERTIFICATES

Unless otherwise stated, three copies of test certificates and product data sheet shall be supplied along with each consignment giving following information:

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

- AA56113, Rev. 02: INORGANIC ETHYL ZINC SILICATE PRIMER
- BHEL Order No. & Date
- Batch / Lot No.
- Supplier's/ Manufacturer's Name and Trade mark, if any
- Quality supplied
- Date of manufacture and expiry
- Test values as per clause 9
- Mixing ratio
- Technical information, if any:

12 PACKING AND MARKING

Unless otherwise stated, the components of paint shall be supplied separately in moisture and leak proof containers in packing size as specified in the BHEL order.

Each container of the consignment shall bear the following information printed or pasted at suitable place so as to protect it from damage during transportation and handling:

- AA56113: INORGANIC ETHYL ZINC SILICATE PRIMER
- BHEL Order No. & Date
- Batch / Lot No.
- Supplier's/ Manufacturer's Name and Trade mark, if any
- Name of contents:
- Mixing ratio:
- Quantity in container
- Date of manufacture and expiry
- Technical information, If any:

13 ENVIRONMENTAL REQUIREMENTS

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

14 PRECAUTIONS

a) Use off the mixed paints within stipulated pot life i.e., 4 hrs after mixing and should be continuously agitated during application.

b) Inorganic Zinc silicate primer should not be applied at relative humidity below 50% and the surface should remain free from condensation at the time of application.

c) After completion of the work, the application equipment must be cleaned thoroughly immediately with thinner and kept safely for next use.

d) The surface to be painted must be blast cleaned to Sa 2 ½, min. and the painting shall be done by spray method uniformly. However, brush may be used for touch up of local areas only.

15 REFERRED STANDARDS (Latest Publications Including Amendments)

1) IS: 101
2) IS: 14355
3) AA0674101
4) ASTM D4752

EPOXY BASED ZINC RICH PRIMER PAINT (TWO PACK)

1.0 GENERAL:

This specification deals with the quality requirements and test for Epoxy Based Zinc Rich Primer Paint suitable for corrosion protection.

2.0 APPLICATION:

The paint shall be used as a primer coat on abrasive blast cleaned steel structures internally and externally, in conjunction with epoxy base paints on fabricated structures and components.

3.0 COMPLIANCE WITH NATIONAL STANDARD:

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

IS: 14589 – 1999 Grade 2 : Zinc priming paint, epoxy based, two-pack specification.

4.0 COMPOSITION:

The paint consists of two components a base and a hardener. The base contains epoxy binder pigmented with zinc dust and suitable extenders. The hardener contains polyamide and solvents to cure the base of paint system.

5.0 MIXING RATION:

The components of paint are to be mixed as recommended in the product data sheet supplied by the manufacturer of the paint.

6.0 COLOUR: Grey.

7.0 FINISH: Smooth and matt.

8.0 FREEDOM FROM DEFECTS:

The base of the paint system shall remain free from defects like hard setting of pigments, skinning and livering when kept in closed container till its shelf life.

9.0 SAMPLING: As per IS: 101

10.0 TECHNICAL REQUIREMENTS:

Unless otherwise specified, the sample (mixed paint) shall be tested in accordance with IS: 101

10.1. Mass PER 10 litres: 21.5 kg per 10 litres, minimum

10.2. Consistency: Paint shall be mixed so that it produces a smooth and uniform paint suitable for application.

10.3. Drying time at room temp. (Hard dry): 4 hours, maximum.

10.4. Volatile matter, percent by mass : 30.0 maximum.

10.5. Pigment content, percent by mass : 65.0 minimum.

10.6. Volume solids, percent : 35.0, minimum.

10.7. Dry film thickness : 45.0 microns, minimum.

10.8. Flash point : 15° C, minimum.

10.9. Pot life at ambient temperature (Annexure-A): 6.0 hours, minimum.

10.10. Metallic zinc content on the non-volatile of the paint (Annexure-B):

85.0 percent by mass, minimum.

11.0 TYPE APPROVAL:

11.1. Samples:

Samples for type approval testing shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory to ensure continuous supply of good product.

11.2. Type tests:

11.2.1. Protection against corrosion under condensation using abrasive blasted steel panel for 28 days (IS 101, Part 6/Section 1):

The test panel, after testing period, shall not show any film deterioration and corrosion of the steel. Crippage shall not more than 3mm on either side of the scribe lines for passing the test.

11.2.2. Resistance to salt spray for 30 days (Annexure-C):

The test panel, after testing period, shall not show any film deterioration and corrosion of the steel. Crippage shall not more than 3mm on either side of the scribe lines for passing the test.

12.0 TEST CERTIFICATES

Unless otherwise stated, three copies of test certificates shall be supplied along with each consignment giving following information:

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

BHEL order

AA56114 , Rev 03 : EPOXY BASED ZINC RICH PRIMER PAINT (TWO PACK)

Manufacturer's/supplier's Name:

Trade name/mark, if any:

Batch/Lot No.:

Quantity supplied:

Date manufacture & expiry:

Test results of clause 9.0

Mixing ratio

13.0 KEEPING PROPERTY

When stored in covered dry place in the original sealed containers under normal temperature conditions, the material shall retain the properties prescribed in this specification for a period of 12 months after the date of manufacture which shall be subsequent to the date of placement of BHEL order.

14.0 PACKING AND MARKING

Unless otherwise stated, base and hardener shall be packed separately in steel containers of approximate capacities. Each container shall bear the following information:

AA56114 EPOXY BASED ZINC RICH PRIMER PAINT (TWO PACK)

BHEL Order No.

Manufacturer's/ Supplier's name:

Trade name / mark, if any:

Batch/Lot No.:

Name of components:

Mixing ratio:

Quantity supplied:

Date of manufacture & expiry:

15.0 ENVIRONMENTAL REQUIREMENTS:

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. asapplicable

16.0 REFRRED STANDARDS (Latest Publications Including Amendments):

1) IS: 101

ANNEXURE - A (Cl 10.9)

If the mixed paint, as recommended by the supplier, could be still thinned, the end of the working life (pot life) has not been reached. The end of the working life is reached when the test material (paint) gels, becomes stringy or cannot be thinned for application. The time interval between the mixing time and time of gelling shall be reported as pot life of the mixedpaint.

ANNEXURE - B (Cl 10.10)

DETERMINATION OF METALLIC ZINC

I. Reagents required:

a) 0.1 N Potassium Permanganate

b) Ferric chloride solution: 20 g of ferric chloride ($FeCl_3$. 6 H_2O) and 20ml of 20% sodium solution.

c) Anhydrous sodium acetate 20% solution.

d) Zimmerman - Reinhardt solution: One litre of solution contains 67g of manganese sulphate (Mn SO_4. 4 H_2O), 130ml of concentrated sulphuric acid and 138ml of phosphoric acid.

II. Procedure:

0.2g of the sample of the pigment is weighed and transferred to 600ml Erinmeyer flask and 50ml of ferric chloride solution is added. The flask is agitated constantly still all zinc is completely dissolved. 50ml of Zimmerman -Reinhardt solution and 250ml of water are added. This is titrated with 0.1 N Potassium permanganate solution till a pink colour is obtained. A blank determination is also carried out using the same amounts of reagents.

III. Calculation:

$$\text{Metallic zinc percent, by mass} = \frac{(V-B)X\ N\ X\ 0.0327}{\text{Wt.of sample in gm}} \times 100$$

Where

V = ml of potassium permanganate solution required for titration

B = ml of potassium permanganate solution required for titration of blank

N = Normality of potassium permanganate solution and

W = wt. of the sample in gram

ANNEXURE - C (Cl 11.2.2)

RESISTANCE TO SALT SPRAY TEST

The test panels of size 50 mm X 1.5 mm of abrasive blasted steel shall be given one coat of paint to produce desired dry film thickness and the paint film is allowed to cure for seven days. In the middle of the panel a scribe mark extending up to metal is made. (Each mark 50 mm long using a cutting edge at least 0.75 mm wide). The painted panels shall be exposed to salt spray test continuously as described in 3 of IS 101 for 30 days.

After specified period of exposure, the test panels shall be examined for deterioration and corrosion of the steel. Crippage shall not be more than 3mm on either side of the scribe lines for passing the test.

HIGH QUALITY FULL GLOSSY OUT DOOR FINISHING PAINT

1.0 GENERAL

This specification governs the quality requirements of synthetic resin, full glossy high quality air drying finishing paint.

The paint shall be capable of being brushed sprayed or flow-coated by thinning suitable with white spirit conforming to BHEL specification AA 56701.

The paint shall be compatible on surface primed with any alkyd based primer conforming to IS : 2074, IS:12744 and BHEL specification AA 56101: Anti corrosive priming paint.

The compatibility shall be checked by cross-cut Adhesion test detailed in Annexure-1.

2.0 APPLICATION

Suitable for application on the surface of outdoor equipment.

3.0 COLOUR

As specified on BHEL order.

4.0 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:2932 - 2003 : SPECIFICATION FOR ENAMEL SYNTHETIC, EXTERIOR;
(a) UNDER COATING (a) FINISHING

with additional requirements of compatibility with priming paint to IS:2074/IS:12744.

5.0 FINISH: Smooth and full glossy.

6.0 FREEDOM FROM DEFECTS:

The paint shall remain free from defects like hard settling of pigments, skinning when kept in a closed container and livering (excessive viscosity build up) during its rated shelf life.

The dried paint shall be free from defects like bittyness, floating of pigments, surface haze, orange peeling, colour fading, wrinkles, etc.

7.0 CHEMICAL COMPOSITION

7.1 Pigments and Total Solids

Only non-chalking rutile titanium dioxide shall be used as a white pigment and any other pigment used shall be light-fast. Extenders shall not be used in general. If absolutely necessary, good quality extenders upto a maximum of 5 percent may be used.

The total volume of solids in the paint shall not be less than 35%. Pthalic Anhydride content shall be 20% min. and shall be certified by the supplier.

7.2 Binder

The binder shall be long oil synthetic alkyd resin free from natural rosins and their derivatives or their modification in any form when tested in accordance with IS:101, part 9, sec 2. The composition of the binder as determined by infra-red sepctrography shall be strictly adhered to the type approved sample in bulk supply.

8.0 TEST SAMPLES

Tender samples will not be required when once the type approval is given and the Supplier concerned declares that the material for which the tender is given is of the same quality as the type approved sample.

Representative samples of the material shall be drawn and treated as prescribed in IS: 101.

9.0 PROPERTIES

Unless otherwise specified, when tested in accordance with IS:101 and IS:2932, the test samples shall show the following properties:

9.1 Drying Time

Surface dry	: 4 hours, max.
Hard dry	: 12 hours, max.
Tack free	: 24 hours, max.

9.2 Consistency

Shall be smooth, uniform and suitable for brushing.
80 to 120 seconds at 27 ±2°C when measured with Ford cup No. 4.

9.3 Gloss 60 deg (Type Test)

Above 71.

9.4 Accelerated Storage Stability Test, 60°C, 96 hours (IS:2932 Annexure F)

Shall pass the test.

9.5 Scratch Hardness after 48 hours of air drying

The test shall be carried out with 1000 g.
No scratch as to show base metal.

9.6 Flash Point

Not below 30°C

9.7 Weight

9.0 kg per 10 litres, min
However it shall be within ±3% of the approved sample of each colour.

9.8 Accelerated Weathering Test

After 21 days exposure under accelerated weathering conditions, the film shall not show any sign of general breakdown, and retain a gloss of 40% of original value.

9.9 Resistance To Acid (IS:2932 Annexure D)

The film shall not show signs of disintegration or change of colour. The loss of gloss shall not be more than 50% of the original gloss.

9.10 Resistance To Alkali (IS:2932 Annexure E)

The film shall not show signs of disintegration or change of colour. The loss of gloss shall not be more than 50% of the original gloss.

9.11 Flexibility and Adhesion

No visible damage or detachment of the film after 96 hours air-drying at room temperature followed by cooling for 5 hours at 0°C.

The test shall be carried out on the cold film, care being taken to ensure that the temperature of the panel and the rods does not exceed 0°C during the bending operation.

9.12 Fineness of Grind

Not more than 15 microns.

9.13 Compatibility with Primer to AA 56101 (IS:2074/IS:12744)

Shall pass the test, when tested as per Annexure I.

10.0 TYPE APPROVAL

10.1 Sample

Sample for type approval testing shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory to ensure continuous supply of good product.

10.2 Type Test

Outdoor Durability Test (IS:2932)

Painted panels prepared and tested as per Appendix C as per C-3 IS:2932 shall satisfy the requirements laid down in the standard for at least 12 months after painting.

11.0 TEST CERTIFICATES

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

In addition, the supplier shall ensure to enclose one copy of test certificate along with their dispatch documents / packing list to facilitate quick clearance of the material. The test certificates shall bear the following details:

1. AA 56126 (Rev.No.06) : High Quality Full Glossy outdoor Finishing paint
2. Colour:
3. Finish
4. Freedom from defects
5. Chemical composition
6. Consistency
7. Spreading capacity
8. Mass per 10 liters
9. Drying / Curing Time
10. Flash Point
11. Lead Content
12. Scratch Hardness
13. Flexibility and adhesion
14. Compatibility
15. Date of manufacture & Expiry
16. Accelerated weathering test
17. Fineness of grind
18. Resistance to acid
19. Resistance to alkali
20. Accelerated storage test

12.0 KEEPING PROPERTY:

When stored under cover in a dry place in the original sealed container at "normal temperature conditions", the material shall retain the properties prescribed in this specification for a period of not less than 12 months after the date of manufacture which shall not be earlier than one month from the scheduled delivery date mentioned in BHEL order.

13.0 PACKING & MARKING:

Unless otherwise stated, the paint shall be packed in 20 litre/ 4 litre steel drums, confirming to IS:2552 & IS:1407. Each container shall bear the following information:

1. AA 56126 : High Quality Full Glossy Outdoor Finishing Paint
2. BHEL Order No.
3. Suppliers Name
4. Type no./ Brand name / Shade
5. Date of manufacture / Batch no.
6. Expiry date
7. Special Instructions (if any)
8. Quantity

14.0 ENVIRONMENTAL REQUIREMENTS :

The supplier shall furnish Material Safety Data Sheet **(MSDS)** covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal alongwith each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

15.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS : 101
2. IS:1407
3. IS:2074
4. IS:2552
5. IS:2932
6. IS:12744
7. IS 13262
8. AA 56101
9. AA 56126
10. AA 56701
11. ASTM D 3359

ANNEXURE - 1 (Cl. 1 & 9.13)

TEST FOR COMPATIBILITY OF FINISHING PAINT (AA 561 26) WITH PRIMER (AA 561 01)

The compatibility of finishing paint to AA 561 26 with primer AA 561 01 shall be checked by tape adhesion test generally in line with ASTM D-3359 except for the following changes as per performance requirement of the paint system.

The adhesion tape used shall be transparent cellulose tape conforming to IS:13262. Tape bearing BIS Certification mark is also acceptable.

2 coats of finishing paint to AA 561 26 are to be applied over 2 coats of primer to AA 561 01 on cleaned and emeried steel plate of size 150x100 mm. Each primer finish coat to be applied after 24 hrs. drying of previous coat without any roughening by emery.

Adhesion test shall be performed after 48 hours of air drying of final coat. Test panels are to be dried at ambient temperature.

Method - B shall be followed and acceptance criteria will be 4B Viz. Small flakes of the coating are detached at intersections and less than 5% of area is effected.

CHEMICAL RESISTANT EPOXIDE FINISHING PAINT

1.0 GENERAL:

This specification governs the quality requirements of Chemical resistant epoxide finishing paint (two pack system) suitable for application by brushing or spraying.

The paint shall be compatible on surfaces painted with epoxide priming paint conforming to BHEL specification AA 561 05.

2.0 APPLICATION:

To protect the outside surfaces of equipment from the effects of salty atmosphere, atmospheric gases forming acids with water and other mineral acids.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

There is no national standard covering this material. However, assistance has been derived from the following national standard:

IS: 14209-1994: Epoxy Enamel, Two Component, Glossy.

4.0 COLOUR:

As specified on BHEL order.

5.0 FINISH:

Smooth and full glossy.

6.0 FREEDOM FROM DEFECTS:

The paint shall remain free from defects like hard settling of pigments, skinning when kept in closed container and livering (exces viscosity build up) during its rated shelf life.

The dried paint film shall be free from defects like bittyness, floating of pigments, wrinkles, orange peeling, surface haze, colour fading, hard particles, etc.,

7.0 CHEMICAL COMPOSITION:

The material shall be based on two components epoxy system with suitable pigments and supplied as base and accelerator. The mixing ratio of base and accelerator shall be as per supplier's recommendations. The type and content of the binding material shall be based on epoxy resin with an epoxy content of 350 to 500.

The material when determined by IR spectography or thin layer chromatography shall be strictly adhered to the **TYPE APPROVED SAMPLE**.

8.0 TEST SAMPLES:

Tender samples will not be required when once the type approval is given and the supplier concerned has to declare that the material for which the tender is given is of the same quality as the type approved sample.

Representative samples of the material shall be drawn and treated as per IS 101.

9.0 PROPERTIES:

Unless otherwise specified, when tested in accordance with relevant parts of IS : 101, the test samples shall show the following properties:

9.1 Consistency:

40 - 60 seconds in Ford cup No. 4 at 27 ± 2^0 C.

9.2 Drying Time:

Surface dry : 1 hour, max.

Hard dry : 12 hours, max.

9.3 Fineness of grind:

6, minimum on Hegman's gauge.

9.4 Gloss at 60^0:

61, minimum.

9.5 Scratch Hardness:

After the film is cured for 7 days at room temperature or 2 hours drying at 70 to 80^0C and after 24 hours air drying and tested under a load of 2000g, no such scratch as to show the bare metal shall be produced.

9.6 Flexibility And Adhesion:

The film shall show no sign of damage, detachment or cracking when tested after 7 days curing at room temperature or 2 hours drying at 70 - 80°C after 24 hours air drying by Erichen tester 5-8, mm.

9.7 Weight:

Between 11 and 12 kg per 10 litres of mixed paint.

9.8 Non-volatile Matter Content:

50%, minimum by weight of the base paint.

9.9 Pigment (Type Test):

20% minimum by weight of the base paint.

9.10 Epoxy Resin Content (Type Test):

30% minimum by weight of the base paint after finding the pigment and non-volatile matter content.

9.11 Resistance to Salt Spray:

The panels prepared from the material shall show no sign of corrosion after continuos exposure for a period of 7 days in the salt spray cabinet.

9.12 Impact Test (DEF-1053):

The film shall not show any sign of damage with a minimum impact of 250 kg-cm.

9.13 Chemical Resistance Test (Appendix-1):

Panels prepared and tested in accordance with Apendix-1 of this specification, when immersed in the liquids at the time, temperature and concentration specified below shall not show any sign of deterioration. Minor changes in colour is acceptable. The film shall not soften, get detached or become brittle.

10% Nitric acid by volume at 60 ± 2^0C for 12 hours.
20% Sulphuric acid by volume at 60 ± 2^0C for 8 hours.
10% Hydrochloric acid by volume at 60 ± 2^0C for 24 hours.
25% Sodium hydroxide by volume at 60 ± 2^0C for 12 hours.
Petrol at room temperature for 24 hours.
Methyl ethyl ketone at room temperature for 24 hours.

9.14 Pot Life (Appendix-2):

6 hours, minimum.

10.0 TYPE APPROVAL:

Samples for type approval testing shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory to ensure continuous supply of good product.

11.0 TEST CERTIFICATE:

Unless otherwise stated, three copies of test certificates shall be supplied along with each consignments, giving the following information.

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

1. AA 561 31, Rev 07: Chemical resistant epoxide finishing paint
2. Colour
3. Finish
4. Freedom from defects
5. Chemical composition
6. Consistency
7. Spreading capacity
8. Mass per 10 liters
9. Drying/Curing Time
10. Heat resistance test
11. Fineness of grind
12. Gloss
13. Non-volatile matter content
14. Scratch Hardness
15. Flexibility and adhesion
16. Resistance to salt spray
17. Chemical Resistance test
18. Compatibility
19. Impact test
20. Pot life
21. Date of manufacture & Expiry

12.0 KEEPING PROPERTY:

When stored in covered dry place in the original sealed containers under normal temperature conditions, the base and accelerator shall retain the properties individually for a period of 12 months after the date of manufacture which shall not be earlier than one month from the scheduled delivery date mentioned in BHEL order, such that the mixed paint shall conform to the properties specified in this specification.

13.0 PACKING AND MARKING:

Unless otherwise stated, base and accelerator shall be packed separately in steel containers of appropriate capacities. Each container shall bear the following information:

AA 561 31: Chemical resistant epoxide finishing paint
BHEL Order No.
Manufacturers/ Supplier's name
Type No./Brand name / Shade
Date of manufacture / Batch/Lot No.
Expiry date
Mixing ratio (if any)
Quantity supplied:
Special instructions (if any)

14.0 ENVIRONMENTAL REQUIREMENTS:

The supplier shall furnish Material Safety Data Sheet **(MSDS)** covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal alongwith each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

14.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS: 101
2. IS: 2932
3. IS: 14209
4. AA 56105
5. DEF: 1053

APPENDIX 1 - CHEMICAL RESISTANCE TEST (Cl: 9.13)

150±2 X 100±2 mm mild steel panels shall be first cleaned from just by rubbing with abrasive paper and suitable solvent.

One coat of the Chromate primer is applied over the cleaned panel on both the sides. After 24 hours of air drying one coat of the finish paint is applied. After 24 hours another coat of the finish paint is applied and dried at 60^0 to 65^0 C for 2 hours or alternatively cured for 7 days at room temperature. The sides of the panel shall be protected with wax coating.

The dried painted panel shall be tested by immersing in respective reagent solution in a closed desecrator and any damaging effect to the film is observed. The film shall not become brittle. Softening and detachment of the film is not acceptable. Slight change in colour is permissible.

APPENDIX 2 - DETERMINATION OF POT LIFE (Cl: 9.14)

About 100ml of the mixed paint prepared by mixing the base and accelerator in the recommended proportions is taken in a beaker. The paint shall be such that it should be usable by brush under a specified pot life of 6-16 hours at room temperature.

In order to check whether the paint has gelled or not, a small quantity of the mixed paint is dissolved in the recommended thinner. It should not dissolve if the paint has gelled and vice-versa.

OIL RESISTANT, AIR DRYING, SYNTHETIC ENAMEL

1.0 SCOPE:

This specification governs the quality requirements of Oil Resistant, Air Drying, Synthetic Enamel.

2.0 APPLICATION:

The material is intended for use on internal metallic surfaces of tanks/vessels, which comes in contact with transformer /mineral oil and meets oil resistant property. The material shall be suitable for use of any (compatible) primer.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall conform to the following national standards, in general, and also meet therequirements of this specification:

IS 14947-2001: Enamel Synthetic, Oil Resistant, Air drying-Specification.

4.0 COLOUR:

As specified in BHEL order.

5.0 FINISH:

Smooth and semi-glossy to glossy

6.0 FREEDOM FROM DEFECTS:

The material supplied shall be free from defects like, hard settling of pigments excessive skinning & viscosity build-up on storage during its rated shelf life.

The dried coating of the paint shall be free from visible defects like, wrinkles, orange peel, colour fading, floating of pigments pin holes, surfaces haze, hard particles etc.

7.0 CHEMICAL COMPOSITION:

The binder of synthetic enamel shall essentially consist of oil-modified alkyd phenolic, free from natural resins or its derivatives or other suitable synthetic resin in the mixture of organic solvents. The type and content of the binder as determined by infrared spectroscopy or thin layer chromatography shall be strictly adhered to the type-approved sample in bulk supply. Supplier shall furnish a copy of spectrograph of each lot along with test certificate.

The enamel shall be suitably pigmented to meet the requirement of this specification and good quality extenders may be used, if necessary. The material shall be free fromhazardous constituents so as to meet the legislative requirements of ISO 14001.

The enamel shall be capable to produce a coating thickness of 30 microns per coat when applied by brush or air spray. The material shall be supplied in brushing consistency but shall also be suitable for application by air spray after thinning with suitable thinner.

CORPORATE PURCHASING SPECIFICATIONS

8.0 TEST SAMPLES:

The material in the container shall be thoroughly mixed to homogenize the contents and 500ml of representative sample shall be drawn in clean and dried container and shall be kept in closed condition for testing purposes.

Unless specified otherwise, tests shall be conducted as prescribed in relevant part and section of IS: 101.

9.0 TECHNICAL REQUIREMENTS:

9.1. Drying Time (at ambient temperature)

a) Surface dry : 3 hours, maximum

b) Hard dry : 12 hours, maximum

9.2. Consistency

a) Smooth and uniform and suitable for brushing and spraying as required

b) Efflux time 80-120 sec.

9.3. MASS IN KGS PER TEN LITRES: 11 min.

9.4. Gloss at 60°: 60, minimum.

9.5. Impact Resistance (DEF 1053) : Shall pass the test.

9.6. BEND TEST: Shall pass the test with 6.25 mm, dia. round mandrel.

9.7. SCRATCH HARDNESS: Shall pass the test when panel is air dried for 7 days and tested at a load of 1500gms.

9.8. RESISTANCE TO TRANSFORMER OIL (90°C, 48 hrs):

When tested in transformer oil conforming to AA27101/IS: 335 at 90°C for 48 hrs, the film shall not soften nor there shall be major change in the colour. The increase in acidity and sludge content shall not be more than 0.1mg KOH/gm and 0.05 gm respectively. The electrical properties of the oil should not adversely be affected.

9.9. RESISTANCE TO HUMIDITY (7 DAYS CONTINUOUS EXPOSURE):

The panel shall not show any sign of deterioration and the metal surface show no sign of corrosion.

9.10. RESISTANCE TO WATER:

The coating shall not show any sign of deterioration when panel is tested as per procedure given in Appendix.

9.11. WATER CONTENT (For information only): 0.5% by mass, max.

9.12. Volume Solids: 35%, min.

10.0 TEST CERTIFICATES

Unless stated, three copies of test certificates shall be supplied furnishing following information:

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

AA56132, Rev 04 : OIL RESISTANT, AIR DRYING, SYNTHETIC ENAMEL

BHEL order No. & Date:

Supplier's Name & address:

Identification/Trade mark, if any:

Batch/Lot No.:

Date of manufacture & expiry:

Quantity:

Test results of clause 7& 9:

Special Instructions, if any:

11.0 KEEPING PROPERTY

When the material is stored in a covered dry place in original sealed container under normal temperature conditions, the same shall retain the properties prescribed in this specification for a period of at least 12 months after the date of manufacture which shall be subsequent to the date of placing the order.

12.0 PACKING AND MARKING:

Unless otherwise stated, the material shall be supplied packed in air tight leak-proof metal containers conforming to IS: 1407 and IS: 2552. Each container shall bear the following information neatly written or pasted at suitable location.

13.0 ENVIRONMENTAL REQUIREMENTS:

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable

14.0 REFRRED STANDARDS (Latest Publications Including Amendments):

1) IS: 5
2) IS:101
3) IS: 335
4) IS:1407
5) IS:2552
6) IS:14947
7) DEF 1053
8) AA27101

CORPORATE PURCHASING SPECIFICATIONS

APPENDIX

TEST METHOD FOR RESISTANCE TO WATER

The enamel is coated on steel bars 12 mm diameters and length 90 mm with round ends. The surface of the bars should be cleaned form rust and the traces of previous coating if any, with the help of emery and trichloroethylene solvent. One coat of enamel is done on the bars and each layer is dried at ambient conditions for 8 hours so as to achieve a coating thickness of 30 microns, min.

The coated bars shall be dried at 110ºC for 3 hours followed by cooling to room temperature before subjecting to test. At least two samples are kept in distilled water in a 250 ml. beaker kept at 60-70ºC for 4 hours. This shall be followed by drying in air at room temperature for one hour. The tested bars are then examined for any deterioration or loss of adhesion of the coating. There shall not be any appreciable change in the colour of coating.

HIGH BUILD BLACK COAL TAR EPOXIDE PAINT

1 GENERAL

This specification governs the quality requirements of two pack anticorrosive High Build Black Coal Tar Epoxide Paint which shall be capable of being brushed or sprayed by suitable thinning with the recommended thinner, if any, so as to obtain a dry film thickness of 4 to 5 mils (100-125µm) per coat.

2 APPLICATION

Suitable for application where high humidity, total immersion in water, severe saline atmospheric condition and chemically corrosive environments prevail.

3 COLOUR

Black

4 COMPLIANCE WITH NATIONAL STANDARDS

Assistance has been derived from IS: 14948 in preparation of this specification.

5 FINISH

Smooth and uniform (See note at clause 9).

6 FREEDOM FROM DEFECTS

The paint shall remain free from defects like hard setting of pigments, skinning when kept in closed container and livering (excess viscosity build up) during its rated shelf life.

The dried paint film shall be free from defects like bittyness, floating of pigments, surface haze, orange peeling, colour fading, wrinkles, etc.

7 CHEMICAL COMPOSITION

The paint shall be composed of suitable grade of coal tar pitch, epoxy resins and accelerator in appropriate proportions to comply with the requirements of this specification. The infra-red spectrograph of epoxy resin used in binder shall be strictly adhered to that of type approved sample. Pigments and extenders used in the composition shall be resistant to chemicals and water.

8 TEST SAMPLES

Tender samples will not be required when once the type approval (Clause 10) is given and the Supplier concerned declares that the material for which the tender is given is of the same quality as the type-approved sample.

Representative samples of the material shall be drawn and treated as prescribed in IS: 101.

9 PROPERTIES

The paint shall be so thinned as to obtain a dry film thickness of 4 to 5 mils per coat. When tested in accordance with relevant parts and clauses of IS: 101 and Appendix-1 to this specification, the test samples shall show the following properties.

9.1 Drying Time at room temperature

– Surface dry : 4 hours maximum.

– Hard dry : 16 hours maximum.

9.2 Scratch Hardness (type Test)*

After the film is cured for 7 days under ambient conditions and tested under a load of 1200 g, no such scratch as to show the base metal shall be produced.

9.3 Flexibility And Adhesion (Type Test)*

The film shall not show sign of damage, detachment or cracking when tested after 7 days curing under ambient conditions.

9.4 Flash Point

Not below 25°C.

9.5 Pot Life (Appendix-1)

4 to 8 hours, min.

9.6 Epoxy Resin Content

25% minimum by mass.

9.7 Volume solid

64%, minimum

9.8 Recoating Property

The painted film shall be capable of receiving one more coat of the same paint between 24 and 96 hours of applying the first coat.

9.9 Effect of Boiling Water for 48 Hours on cured film (Type Test)

No softening or peeling off, of the film shall take place.

9.10 Effect of heating at 150°C + 2°C in air for 48 hours

No softening or peeling off, of the film shall take place.

*Note: Scratch hardness, flexibility and adhesion and finish tests shall be conducted on painted grit blast steel panel while the other conditions of IS: 101 remaining unchanged.

10 TYPE APPROVAL

Samples:

Samples for type approval testing shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory to ensure continuous supply of good product.

11 TEST CERTIFICATES

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

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

The test certificates shall bear the following information:

– AA56135, Rev. 05: HIGH BUILD BLACK COAL TAR EPOXIDE PAINT

– BHEL Order No.

– Batch / Lot No.

– Supplier's/ Manufacturer's Name and Trade mark, if any

– Date of manufacture and expiry
– Test results of clauses 7 and 9

12 KEEPING PROPERTY:

When stored in a covered dry place in the original sealed container under normal temperature conditions, the base and accelerator when mixed in appropriate proportions shall retain the properties prescribed in this specification for a period of 12 months after the date of manufacture, which shall not be earlier than one month from the scheduled delivery date mentioned in BHEL order.

13 PACKING AND MARKING

Unless otherwise stated, base and accelerator shall be packed separately in steel containers of appropriate capacities.

If stated in BHEL order, the recommended thinner shall also be supplied in sufficient quantity.

Each container shall bear the following information:

– AA56135: HIGH BUILD BLACK COAL TAR EPOXIDE PAINT
– BHEL Order No.
– Batch / Lot No.
– Supplier's/ Manufacturer's Name and Trade mark, if any
– Quantity
– Date of manufacture and expiry

14 ENVIRONMENTAL REQUIREMENTS

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

15 REFERRED STANDARDS (Latest Publications Including Amendments)

1) IS: 101

APPENDIX – 1

DETERMINATION OF POT LIFE (CLAUSE 9.6)

About 100 ml of the mixed paint prepared by mixing the base and accelerator in the recommend proportions is taken in a beaker. The paint shall be such that it should be usable by brush under a specified pot life of 6 - 12 hours at room temperature.

In order to see if the paint has jelled or not, a small quantity of the mixed paint is dissolved in the recommended thinner. It should not dissolve if the paint has jelled and vice-versa.

FULL GLOSS POLYURETHANE FINISHING PAINT

1.0 SCOPE:

This specification governs the quality requirements of Polyurethane Finishing Paint (Two pack system). This is recommended for exterior applications where it is desirable for gloss retention for long periods, chemical and corrosion resistance. This paint is suitable for both brush and spray application.

The paint shall be compatible on surface primed with epoxy priming as per AA56109 and intermediate paint as per AA56112.

2.0 APPLICATION:

Suitable for use in as those exterior surfaces where it is designed to retain colour and gloss for long period in addition to provide excellent chemical and corrosion resistance.

3.0 COLOUR

As specified in BHEL order.

4.0 COMPLIANCE WITH NATIONAL STANDARD:

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

IS: 13213 - 1991(RA-2007): "POLYURETHANE FULL GLOSS ENAMEL (TWO PACK)"

5.0 FINISH: Smooth and full glossy

6.0 FREEDOM FROM DEFECTS:

The components of the paint shall remain free from defects like hard settling of pigments, skinning, livering (excessive viscosity build up) when kept in closed container till its shelf life.

The dried paint film shall be free from defects like bittyness, floating of pigments, surface haze, orange peeling, colour fading, wrinkles etc.

The paint shall conform to the requirements of ISO 14001 and shall be free from lead/ lead components.

7.0 CHEMICAL COMPOSITION:

The paint consists of two components enamel and a hardener solution to be mixed by volume. The mixing ratio of base and hardener shall be as per supplier's recommendation. Enamel shall consist of an appropriate polyol, pigments, solvents and additives. The hardener solution shall consist of an aliphatic polyisocyanate, solvents, and additives.

Note:

1) The base contains acrylic resin and acid /alkalic / light fast pigments.
2) The mixed paint shall be stirred well for 20 minutes to mature and must be consumed within 4.0 hours after mixing.
3) The content and nature of the components shall be strictly same as type approved sample. This shall be confirmed by IR spectrography / thin layer chromatography which should be provided by supplier.

8.0 TEST SAMPLES:

Tender samples will not be required when once the type approval is given and the supplier concerned declares that the material for which the tender is given of the same quality as the type approved sample.

Sampling of paint shall be done as per IS: 101.

8.1. To draw a representative sample, the contents of the container selected for sampling shall be mixed as thoroughly as possible by shaking or stirring or both or by rolling, so as to bring all portions into uniform distribution.

8.2. The samples shall be taken in a suitable, clean, dry air-tight glass bottle of one litre capacity. It should be almost but not completely filled by the sample.

8.3. In case of failure of first sample, two samples shall be drawn from other two drums of the same consignment at random and failure of the second sample in complying with the specification will lead to the rejection of the whole consignment.

9.0 TEST METHODS

Unless otherwise specified, the samples shall be tested in accordance with relevant part and section of IS 101

9.1. PROPERTIES:

9.1.1. Drying Time (at ambient temperature)

a) Surface dry : 3.0 hours, maximum

b) Hard dry : 8.0 hours, maximum

c) Full cure : 7days, maximum

d) Hard dry at 70ºC : 30 minutes, maximum with 15 minutes flash off time.

9.1.2. Consistency

Suitable for brushing and spraying. 40 - 60 secs by F.C No.4 at 27 ± 20º C.

9.1.3. Fineness of grind

10 microns, minimum

9.1.4. Gloss at 60º

85, minimum.

9.1.5. Scratch Hardness after full cure for 7 days under load of 1000 gms, min.

No such scratch as to show the bare metal

9.1.6. Flexibility and adhesion test

No visible damage or detachment of paint film when tested by Erichsen cupping test up to 8mm.

9.1.7. Weight

9.0 kg, minimum per 10 litres of mixed paint. However it shall be within ± 3.0% of type approved sample.

9.1.8. Dry film thickness per coat of application

25 - 30 microns

9.1.9. Volume solids

40.0%, minimum

9.1.10. Flash Point

20°C, minimum of each component

9.1.11. Pot life at 27±2°C

4.0 hours, minimum

10.0 TYPE APPROVAL

10.1. Samples

Samples for type approval testing shall be accepted only from those manufactures whose manufacturing and testing facilities are considered satisfactory to ensure continuous supply of good product.

10.2. Type Test

10.2.1. Accelerated Tests (IS:13213):

Tests shall be conducted as per procedure given in below for chemical resistance to Sulphuric acid, Caustic potash, Oil & Solvents and the result shall not show any signs of blistering, wrinkling and lifting. Difference in gloss and colour between immersed and un-immersed area of paint film shall be minimum.

PROCEDURE:

Preparation of painted panels generally as per IS: 101.

Apply one coat of epoxy zinc phosphate primer (two pack) at minimum 35microns dry film thickness by spraying and allow to dry for at least 6 hours and not more than 24 hours. Dry rub with emery paper No.400 and wipe clean with a dry soft cloth.

Apply one coat of epoxy surfacer (two pack) at minimum 35 microns dry film thickness by spraying and allow to dry for at least 6 hours and not more than 24hours. Wet rub with water proof emery paper No.400 and allow to dry.

Apply one coat of full gloss polyurethane enamel (two pack) at minimum 35microns dry film thickness by spraying and allow to air dry for 7 days.

Note: For immersion tests prepare and paint both sides of the panels and protect the edges of the panels by sealing with a chlorinated rubber paint.

Resistance to Sulphuric acid:

Immerse 3/4thof the panel in 30% sulphuric acid for 24 hours. Remove the panel, wash in running fresh water and allow it to dry for an hour.

Resistance to Caustic potash:

Immerse 3/4thof the panel in 20% solution of potassium hydroxide for 24 hours. Remove the panel, wash in running fresh water and allow it to dry for an hour.

Resistance to Oil:

Immerse 3/4thof the panel in a mineral lubricating oil for 24 hours. Remove the panel and wipe the excess oil with cotton, wash it with mineral turpine and allow to dry for 30 minutes.

Resistance to Solvents:

Test one panel for resistance to xylene, ethanol and acetone respectively. Take a clean white sterilized cotton and soak it in the solvent and place it on the painted panel without squeezing the cotton. Immediately cover the soaked cotton with a suitable watch glass and leave it for 6 hours. Remove the watch glass and the soaked cotton, wipe the area with a clean dry cotton.

10.2.2. Durability Test (IS:8662)

10.2.2.1. Normal Outdoor Exposure Test:

Preparation of panels for the test and tests shall be as per procedure given in Annexure. Test panels shall be exposed at an angle of 450 facing south. The test shall satisfy the requirements laid down for at least 12 months after painting.

10.2.2.2. Accelerated Weathering Test (IS:8662)

The test shall satisfy the requirement laid down, after 1000 hrs. test in Xenon Arc Type Weatherometer (with rotating day / night device) with a cycle of 3 minutes rainfall and 17minutes dry period.

PROCEDURE:

Preparation of panels for the test shall be as per the procedure given in the Annexure. Samples of panels shall be tested in duplicate in a accelerated weathering apparatus and samples drawn from the exposed films shall be evaluated for gloss and various film properties.

The requirement of the test shall be taken to have been satisfied if the performance in respect of the film characteristics is within the limits specified below:

a)	Gloss	The film shall have a minimum gloss retention of 50% of the original value
b)	Colour	The film shall have a minimum rating of 8
c)	Freedom from Checking, Cracking, Flaking, Chalking, Spotting, Blistering and corrosion	-do-

NOTE:

a) Test certificate of Cl.10.2.1 & 10.2.2 shall be forwarded by the supplier in line with IS: 13213 and IS: 8662 at the time of type approval. While supplying the material supplier shall furnish these test certificates after every two years.

b) Supplier should submit the results of Cl.10.0 at the time of type approval and once in a year there after.

11.0 TEST CERTIFICATES:

Unless otherwise specified, three copies of test certificates shall be supplied giving the following information.

In addition, the supplier shall ensure to send one copy of test certificates along with the despatch documents to facilitate quick clearance of the material.
AA56142 (Rev.No.06) – FULL GLOSS POLYURETHANE FINISHING PAINT

BHEL Order No.

Supplier's Name& Trade Mark, if any.

Batch No.

Date of Manufacture

Test Results of clause 7.0:

12.0 KEEPING PROPERTIES

When stored under cover in a dry place in the original sealed container under normal temperature conditions, the base and accelerator shall retain the properties of the mixed paint prescribed in this specification for period of not less than 12 months after the date of manufacture which shall not be earlier than one month of the scheduled delivery date mentioned in BHEL order.

13.0 PACKING AND MARKING:

Unless otherwise stated, base and accelerator shall be packed separately in steel containers of appropriate capacities. Each container shall bear the following information:

AA56142: FULL GLOSS POLYURETHANE FINISHING PAINT

BHEL Order No.

Manufacturer's / supplier's name.

Trade mark, if any.

Batch/lot no.

Date of manufacture and expiry.

Quantity supplied.

Mixing ratio.

14.0 ENVIRONMENTAL REQUIREMENTS:

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply. Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

15.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1) IS:101
2) IS:8662
3) IS:335
4) IS:13213
5) AA56109
6) AA56112

ANNEXURE (Cl: 10.2.2.1)

PROCEDURE OF DURABILITY TEST:

PREPARATION OF TEST PANELS:

The panel shall be mild steel plate of 1.25mm thick and free from surface defects. Size of the panel for outdoor exposure test shall be 300mm x 300mm and for the Accelerated weathering test 150mm x 150mm. Panels shall be cleaned and the back and edges of the panels shall be protected with two coats of a suitable paint.

The surface of the test panels to be exposed shall be prepared as follows, taking care that total dry film thickness of the complete system shall be between 75 and 100 microns. Air drying of films shall be done at temperature 27±2° C and at a relative humidity of 65± 5 percent.

a) Apply one coat of ready mixed paint red oxide zinc chrome primer by brushing and allow to air dry for 24 hours.

b) Rub down lightly with waterproof emery paper No.280/330, wipe off the surface with a clean and dry soft cloth and then apply by brushing one coat of the under coating enamel and allow it to dry for 24 hours.

c) Rub down, wet, with water proof emery paper No.280/320 wipe off the surface with a clean and dry soft cloth and then apply by brushing one coat of the finishing enamel and allow it to dry for 24 hours.

d) Rub down, wet, with water proof emery paper No.220, wash and wipe off water, and when the surface is dry, apply by brushing a second coat of the finishing enamel and allow it to dry for 7 days before subjecting to exposure test.

OUT DOOR EXPOSURE TEST:

Expose in open the test panels prepared as above in duplicate at an angle of 45° facing south. Examine the condition of the exposed films at monthly intervals for the first quarter and thereafter quarterly for the rest of the period for the properties gloss, colour, checking, cracking, flaking, chalking and spotting.

For the above examinations, wash the right hand half of the surface of the two test panels by pouring water and then wiping with a soft cloth or chamois leather. Examine the same half of the test panel at each examination. At the end of the stipulated period for durability test examine the two halves of the test panels. The sample shall be considered satisfactory if the material surface underneath as well as condition of the film in both the halves, the one washed periodically as well as the one washed only for the final examination is satisfactory by the method of evaluation given below. Stray film failure due to extraneous causes other than climatic shall be ignored.

CORPORATE PURCHASING SPECIFICATIONS

ANNEXURE - CONTINUED

Evaluation and Rating of Film Characteristics:

a) Gloss: Specular 45º and 60º head glossometer reading.

b) Colour: The initial rating for a good colour match shall be 10. The colour Retention on exposure shall be expressed and recorded as the abbreviation of the type of colour change followed by numerical rating as follows:

RATING		TYPE OF COLOUR CHANGE	
10	- Good match	D	- Darkening
9	- Satisfactory	F	- Fading
8-7	- Slight colour change	B	- Blueing
6-5	- Definite colour change	R	- Reddening
4-3	- Bad Colour change	Y	- Yellowing
2-1	- Very bad colour change	L	- Loss of colour
0	- Complete colour change		

c) Checking: Freedom for checking shall be rated as 10 for no checking and0 for most severe and complete checking.

d) Cracking: Freedom for cracking shall be rated as 10 for no cracking and0 for most severe and complete cracking.

e) Flaking: Freedom for flaking shall be rated as 10 for no flaking and0 for most severe and complete flaking.

f) Chalking: Freedom for chalking shall be rated as 10 for no chalking and0 for most severe and complete chalking.

g) Spotting: Freedom from spotting shall be rated as follows:

Numerical value	Rating
10	No spotting
9	Satisfactory
8-7	Slight spotting
6-5	Definite spotting
4-3	Bad spotting
2-1	Very bad spotting
0	Complete spotting

h) Blistering and Corrosion: The film shall remain generally free from blisters and the metal underneath shall show no signs of corrosion on exposure for12 months. A few isolated blisters without any signs of corrosion underneath as well as one or two localized corrosion and/or rust spots shall not constitute a cause of failure.

PETROLEUM HYDROCARBON SOLVENT (GR.: 145/205)

1.0 GENERAL:

This specification governs the quality requirements of Petroleum hydrocarbon solvent, Gr.: 145/205, low aromatic.

2.0 APPLICATION:

Suitable for use in paint industry in general. This solvent is used as a thinner for all Alkyd Based paints

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

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

IS: 1745 – 1978(RA-2005) : Petroleum hydrocarbon solvents
Gr.: Solvent 145 / 205, low aromatic

4.0 FREEDOM FROM DEFECTS:

The material shall be clear and free from sediments suspended matters and undissolved water..

5.0 COMPOSITION:

The material shall be a petroleum distillate.

6.0 TEST SAMPLES:

Test samples shall be supplied for testing and approval as per IS: 1447.

6.1 To draw a representative sample, the contents of the container selected for sampling shall be mixed as thoroughly as possible by shaking or stirring or both or by rolling, so as to bring all portions into uniform distribution.

6.2 The samples shall be taken in a suitable, clean, dry air-tight glass bottle of one liter capacity. It should be almost but not completely filled by the sample.

6.3 In case of failure of first sample, two samples shall be drawn from other two drums of the same consignment at random and failure of the second sample in complying with the specification will lead to the rejection of the whole consignment.

7.0 PROPERTIES:

When tested in accordance with the test methods shown against each clause, the test samples shall show the following properties:

7.1* Colour (Say bolt) (IS: 1448-Part 14):
+ 20, minimum

7.2 Copper Strip Corrosion Test (IS: 1448-Part 15):
Not worse than No. 1, at 50^0C for 3 hours.

7.3 Density (IS: 1448-Part 16):
g per ml, at 15^0C: Not limited but to be reported.

7.4 Flash Point (Abel) (IS: 1448-Part 20):

35^0 C, minimum.

7.5 Residue on Evaporation (IS: 1448-Part 29):

5 mg per 100 ml, maximum.

7.6 Aromatic Content (IS: 1448-Part 48):

40% by volume, maximum.

7.7 Distillation Range:

7.7.1 Initial boiling point (IS: 1448-Part 18):

145^0 C, minimum.

7.7.2 Final boiling point:

205^0C. maximum

7.7.3 50% by volume at, in ^{0}C:

Not limited but to be reported.

7.7.4 95% by volume at a temperature:

Not limited but to be reported.

8.0 TEST CERTIFICATES:

Unless otherwise specified, Three copies of test certificates shall be supplied along with each consignment.

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

The test certificates shall bear the followings information

AA 567 01, Rev.No.05 : Petroleum Hydrocarbon Solvent, Gr.: 145/205, Low aromatic
BHEL Order No.
Manufacturer's/Supplier's Name.
Trade Mark, if any.
Batch No.
Date of Manufacture and expiry
Test results of clauses 7.0

9.0 Acceptance Criteria: Material shall be accepted on the basis of test results furnished by supplier and testing at BHEL in respect of Cl 7.3, 7.5, 7.7.1, 7.7.2.

10.0 PACKING AND MARKING:

The material shall be packed in mild steel made, road tankers which shall be thoroughly cleaned before filling.

Each container shall marked with the following information:

AA 567 01 : Petroleum Hydrocarbon Solvent, Gr.: 145/205, Low aromatic

BHEL Order No.

Manufacturer's/Supplier's Name.

Trade Mark, if any.

Batch/Lot No.

Date of Manufacture

Quantity supplied.

A caution label **"FLAMMABLE"** together with the corresponding symbol for labelling dangerous goods.

11.0 ENVIRONMENTAL REQUIREMENTS:

The supplier shall furnish Material Safety Data Sheet **(MSDS)** covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal alongwith each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable

12.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS : 1447 2. IS: 1448 3.IS:1745

THINNER FOR EPOXY PAINTS

1 GENERAL

This specification governs the quality requirements of Thinner for all types of Epoxy Paints.

2 COMPLIANCE WITH NATIONAL STANDARDS

There is no Indian standard covering the requirements of this material.

3 FREEDOM FROM DEFECTS

The material shall be clear and free from sediments, suspended and undissolved matters.

4 TEST SAMPLE

½-litre sample shall be drawn from each consignment for testing and approval.

5 COMPOSITION

The material shall be a blend of either esters, ketones and/or Aromatic hydrocarbons.

6 PROPERTIES

The material shall be compatible with all types of epoxy and stoving (priming and finishing) paints.

7 TEST CERTIFICATES

Unless otherwise stated, three copies of test certificates shall be supplied, along with each consignment, giving the following information:

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

The test certificates shall bear the followings information:

- AA56708, Rev. 04: THINNER FOR EPOXY PAINTS
- BHEL Order No.
- Supplier's/ Manufacturer's Name and Trade mark, if any
- Batch / Lot No.
- Date of manufacture & Expiry, if any.
- Test results of clause 6

8 PACKING & MARKING

The material shall be suitably packed in 20 litre drums to avoid damage during transit. Each container shall be marked with the following information:

Each container shall bear the following information:

- AA56708:THINNER FOR EPOXY PAINTS
- BHEL Order No.

Revisions:			**APPROVED**: INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(CPO+NM)		
Rev No.04	Amd No.	Reaffirmed	Prepared HEP, Bhopal	Issued Corp.R&D	Dt. of 1st Issue 01-08-1988
Dt:26-05-2012	Dt:	Year:2019			

- Supplier's / Manufacturer's Name and Trade mark, if any.
- Batch/Lot No.
- Date of manufacture & Expiry, if any.
- Quantity supplied

9 Environmental Requirements

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

10 REFERRED STANDARDS (Latest Publications Including Amendments)

1) Nil

इंटरनेट मानक

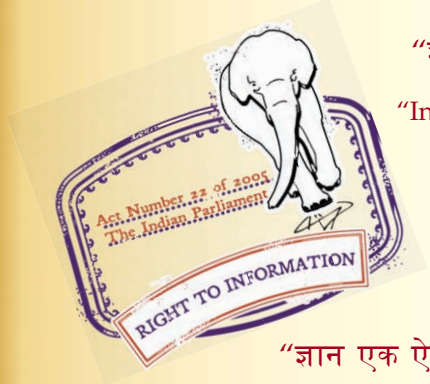
Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 13183 (1991): Aluminium paint, heat resistant [CHD 20: Paints, Varnishes and Related Products]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS 13183 : 1991

भारतीय मानक

एल्यूमिनियम रोगन, उष्मा प्रतिरोधी — विशिष्टि

Indian Standard

ALUMINIUM PAINT, HEAT RESISTANT — SPECIFICATION

UDC 667.633.42 : 669.71

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 1991 **Price Group 2**

Paints and Allied Products Sectional Committee, CHD 020

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints and Allied Products Sectional Committee had been approved by the Chemical Division Council.

Considering the need of an aluminium paint for the painting of steel structures and equipments to prevent corrosion at high temperature, it was decided to formulate a standard on heat resistant paint.

Paint complying with this standard is intended for interior and exterior use on metal surfaces that may be subjected to temperature up to 600°C.

The paint is intended for use on gasoline, diesel and steam engines, steam turbines, pumps etc and interior structural members of boilers and boiler houses.

For the purpose of deriding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 2 MAY 2002
TO
IS 13183:1991 ALUMINIUM PAINT, HEAT RESISTANT — SPECIFICATION

(*Page* 2, *Table* 1, *Sl No* 2, *col* 2) — Substitute 'Non volatile matter and pigment content' *for* 'Non-volatile matter'.

(*Page* 2, *Table* 1, *Sl No.* 2, *col* 4) — Substitute '101 (Part 8/Sec 2) 1990' *for* '27 of IS 101 1964'.

(CHD 20)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 1 JANUARY 1993
TO
IS 13183 : 1991 ALUMINIUM PAINT, HEAT RESISTANT — SPECIFICATION

(*Page* 3, *clause* **B-1**, *informal table, line* 4) — Delete

(*Page* 3, *clause* **B-1**, *para* 2, *line* 6) — Substitute 'grade 1' *for* 'grade 3'

(*Page* 3, *clause* **C-2**) — Substitute 'STEEL' *for* 'STFEL'

(*Page* 4, *Annex* E) — Delete

(CHD 020)

Reprography Unit, BIS, New Delhi, India

Indian Standard

ALUMINIUM PAINT, HEAT RESISTANT — SPECIFICATON

1 SCOPE

This standard prescribes the requirements, methods of sampling and test for the heat resistant Aluminium Paint. This material shall withstand solvents, normal weather exposure and temperature up to 600°C.

1.1 The material will be used as a finishing heat resistant paint for chimneys, stacks, boiler, pipes and furnace structures where protection to moderate corrosive marine and industrial environment and heat resistance are required.

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 COMPOSITION AND GRADES

The material shall be based on suitable binders such as silicone resin, organic titanates, hydrocarbon resin or synthetic rubber resins alongwith aluminium paste (*see* IS 289 : 1963) and extender pigments in suitable proportions

Grade 1 — up to 600°C

Grade 2 — up to 400°C

Grade 3 — up to 200°C

NOTES

1 Composition mentioned in the specification should be treated as guidelines and not mandatory upon the manufacturer.

2 Maximum operating temperature resistance for a paint is limited by melting point of the pigment. Since melting point for aluminium is 600°C, paints above 600°C temperature resistance are not recommended.

4 REQUIREMENTS

4.1 The paint shall be suitable for brushing or spraying without reduction.

4.2 Keeping Properties

The paint shall not skin, gel, thicken excessively or cake in the original unopened container for a period of not less than one year from the date of manufacture.

4.3 Heat Resistance

Films of paint prepared and tested as in Annex B shall show no cracking, blistering, flaking or peeling. When cut as in Annex B the paint shall adhere tightly to the metal.

4.4 Salt Spray Resistance

Films of paint prepared and tested as in Annex C and examined immediately after removal from the test shall show not more than a trace of rusting and not more than 5 blisters, non of which is larger than 1 mm in diameter. Dulling or staining unaccompained by red rusting shall be permitted. On removal of the paint from the panels tested as in C-2, the surface of the steel shall show no more than a trace of rusting, pitting or corrosion.

4.5 Water Resistance

A film of paint when tested as in Annex D shall show no wrinkling or blistering immediately upon removal of the panel from the water. The paint shall be no more than slightly affected when examined 2 hours after removal, and after 24 hours air drying, the portion of the paint which was immersed shall show no more than a slight whitening or dulling in comparison to the portion that was not immersed.

4.6 Mass in kg/10 Litres

The minimum mass in kg/10 litres of the material, when tested as per IS 101 (Part 1/Sec 7) : 1987 shall be within ± 3 percent of the approved sample.

4.7 The material shall also conform to the requirements given in Table 1.

5 PACKING AND MARKING

5.1 Packing

The paint shall be packed as agreed to between the purchaser and the supplier.

5.2 Marking

The container shall be marked with the following information:

a) Name and grade of the material;

b) Indication of the source of manufacture;

c) Volume of the material;

d) Batch No. or Lot No. in code or otherwise;

e) Month and year of manufacture; and

f) Caution notes as follows;

i) The material is to be kept away from flames, and

ii) Use only with adequate ventilation. Avoid prolonged breathing of vapour or contact with skin.

Table 1 Requirements for Aluminium Paint, Heat Resistant

(*Clause* 4.7)

Sl No.	Characteristic	Requirement	Method of Test Ref. to IS No.
(1)	(2)	(3)	(4)
1)	Drying time		
	a) Surface dry h, *Max*	1	101 (Part 3/Sec 1) : 1986
	b) Tack free h, *Max*	3	
	c) Hard dry h, *Max*	18	
2)	Non-volatile matter, percent by mass, *Min*	30	27 of IS 101 : 1964
3)	Flash point, °C	Above 27°C	101 (Part 1/Sec 6) : 1967
4)	Colour	That of metallic aluminium	11 of IS 101 : 1964
5)	Finish	Bright, smooth & lustrous	101 (Part 3/Sec4) : 1987
6*	Scratch hardness, (750 g load)	To pass the test	101 (Part 5/Sec 1) : 1988
7)*	Flexibility and adhesion, after 48 hours drying	- d o -	101 (Part 5/Sec 2) : 1988
8)*	Protection against corrosion under conditions of condensation (7 days)	- d o -	101 (Part 6/Sec 1) : 1988
	Consistency, Sec, *Min*	20	101 (Part 1/Sec 5)

*Applicable only to grade 2 and 3 and to be carried out after full cure

6 SAMPLING

6.1 Representative samples of the material shall be drawn as prescribed in IS 101 (Part 1/Sec 1) 1986

6.2 Criteria of Conformity

A lot shall be described as conforming to the requirements of this standard, if the test results of the composite sample satisfy all the requirements prescribed under **4.**

7 TESTS

7.1 Tests shall be conducted as referred in col 4 of Table 1.

7.2 Quality of Reagents

Unless otherwise specified, pure chemicals and distilled water (*see* IS 1070 : 1977) shall be employed.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
101 1964	Methods of test for ready mixed paints and enamels (*second revision*)
101 (Part 1/Sec 1) 1086	Methods of sampling and test for paints, varnishes and related products . Part 1 Test on liquid paints (general and physical) Sec 1 Sampling (*third revision*)
Sec 5) : 1987	Sec 5 Consistency (*under print*)
Sec 6) : 1987	Sec 6 Flash point (*third revision*)
Sec 7) 1987	Sec 7 Mass per 10 litres (*third revision*)
(Part 3/Sec 1) : 1986	Part 3 Tests on paint film formation Sec 1 Drying time (*third revision*)

IS No.	*Title*	*IS No.*	*Title*
Sec 4) : 1987	Sec 4 Finish (*third revision*)	(Part 6/Sec 1) . 1887	Part 6 Durability tests on paint films Sec 1 Durability under conditions of condensation (*third revision*)
(Part 5/Sec 1) : 1987	Part 5 Mechanical tests on paint films Sec 1 Hardness test (*third revision)*	289 : 1963	Aluminium paste for paints (*revised*)
Sec 2) : 1987	Sec 2 Flexibility and adhesion (*third revision*)	1070 : 1977	Water for general laboratory use (*second revision*)

ANNEX B

(*Clause* 4.3)

TESTING OF HEAT RESISTANCE

B-1 HOT ROLLED STEEL

Select eight 10 cm × 15 cm panels which are completely free of loose mill scale from 14 gauge as rolled commercial quality low carbon steeh Clean it with the solvent, aliphatic naphtha-ethylene glycol monethyl ether solvent mixture. Spray the paint, one or two coats, on all the eight panels so as to obtain a total dry film thickness between 20 to 30 microns. Dry it in air for 24 hours. Place the panels in furnace in such a way that no part of these is in direct contact with the bottom or sides of the furnace and subject to the following heating schedules.

Grade	*Time*	*°C*
3	8 h	200
2	4 h	300
	1 h	400
	1 h	600
1	8 h	400
	8 h	500
	8 h	600

Remove the panels from the furnace for as short a period of time as possible and inspect (except for knife test) for compliance with **4.3** at the end of each heating period. Remove two panels at the end of the 400°C, for grade 2, and 500°C, lor grade 3, healing periods lor use in the salt spray test (*see* Annex C) At the conclusion of the heating schedule remove the remaining two panels, allow to cool in air for 24 hours, cut with a knife blade and observe for conformity with **4.3.**

B-2 COLD ROLLED STEEL

Prepare and clean the panels as in **B-1** Apply the paint to the side of the pane! that has been flat polished Air dry for 30 minutes and bake at 250°C for 1 hour. Cool to room temperature Place the panels in a furnace and heat for 24 houts, in a furnace that has been previously raised to a temperature of 600° ± 2°C. Remove from the oven, cool and inspect for conformity with **4.3** performing the knife test as in **B-1.**

ANNEX C

(*Clause* 4.4)

TESTING OF SALT SPRAY RESISTANCE

C-1 HOT ROLLED STEEL

Expose the unscared panels removed from the 400°C or 500°C heating periods of **B-1** to the salt spray for 24 hours as per **3** of IS 101 (Part 6/ Sec 1). Upon removal wash the panels gently in warm running water until free from any visible salt deposits and examine immediately for conformity with **4.4.**

C-2 COLD ROLLED STFEL

Prepare three 10 cm × 30 cm steel panels as in **B-2**, except that these are not to be heated up to 600°C. Expose the unscored panels to the salt spray as in **C-1** for 96 hours, Upon removal, wash the panels gently in warm running water until free from any visible salt deposits and examine immediately for conformity with **4.4.**

ANNEX D

(*Clause* 4 5)

TESTING OF WATER RESISTANCE

D-1 Prepare a film of paint as in **B-2**, except do not heat to 600°C. Coat all exposed uncoated metallic surfaces with wax or suitable coating and immerse the panel for 24 hours at 27 ± 2°C. Upon removal, observe the panel for conformity with **4.5**.

ANNEX E

(*Table* 1, *Sl No.* 5)

DETERMINATION OF SILICON CONTENT

E-1 Place the extracted vehicle in a flask and distill off most of the solvent. Transfer the concentrated resin solution to a tared platinum crucible, using benzene to wash the flask thoroughly, and evaporate the remaining solvent on a steam bath. Add 4 to 5 drops of chlorobenzene which reduces frothing on some samples, and agitate or warm the contents to dissolve the samples, Add 2 ml of 15 percent fuming H_2SO_4 to the solution at room temperature, followed by 0 5 ml of fuming HNO_8. Hold over a low flame or heat several hours to accomplish digestion. When the mass has solidified and danger of frothing is past, heat the crucible to complete expulsion of SO_8 fumes. Place residue, usually black, in a muffle furnace for 1 hour at 800°C and weigh the remaining residue as silicon dioxide (SiO_3).

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Doc : No. CHD 20 (0014)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at New India Printing Press, Khurja, India

IS 13213 (1991): Polyurethane full gloss enamel (two pack)
[CHD 20: Paints, Varnishes and Related Products]

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IS 13213 : 1991
(Reaffirmed - 2012)

भारतीय मानक

पॉलियूरिथेन, पूर्ण चमक वाला इनैमल (दो पैक) – विशिष्टि

Indian Standard

POLYURETHANE FULL GLOSS ENAMEL (TWO PACK) - SPECIFICATION

UDC 666.293

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 1991 **Price Group 4**

Paints (Other than Industrial Paints) and Allied Products Sectional Committee, CHD 020

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints (Other than Industrial Paints) and Allied Products Sectional Committee had been approved by the Chemical Division Council.

High performance coatings based on synthetic polymers are a recent development. Polyurethane surface coatings being the most recent addition, are probably one of the best available system for corrosion protection of steel. It is also the economical among other anti-corrosion coatings. It not only wards off corrosion but also fortifies the steel against chemical attack and physical damage.

The use of polyurethane paints, presents a two-fold potential hazards such as toxic and fire hazards. The safety precautions should be taken in handling and painting of these materials (*see* Annex J).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised)* '. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AMENDMENT NO. 1 DECEMBER 1994
TO
IS 13213 : 1991 POLYURETHANE FULL GLOSS ENAMEL (TWO PACK) — SPECIFICATION

(*Page* 1, *clause* **1.1.1**, *line* 2) — Delete the words '(conventional air/airless)'.

(*Page* 1, *clause* **4.1.1**, *line* 2) — Delete the word 'extenders'.

(*Page* 1, *clause* **5.4**) — Add the following after the word 'apparatus':

'However during mixing of two components in large quantities, the mixing may be done using a high speed stirrer and the rise in temperature shall not be more than 5°C.'

(*Page* 2, *Table* 1) — Add the following after Sl No. (i)(b):

Sl No.	Characteristic	Requirement	Method of Test	
			Annex	Ref to IS No.
(1)	(2)	(3)	(4)	(5)
c)	Hard dry, 70°C, *Max*	30 min, with 15 min flash off time	—	101 (Part 3/Sec 1) : 1986 (*see* Note)

[*Page* 2, *Table* 1, *Sl No.* (i), *col* 5] — Substitute '101 (Part 3/Sec 1) : 1986' *for* '101 (Part 3/Sec 5) : 1987'.

[*Page* 2, *Table* 1, *Sl No.* (xiv)] — Substitute 'Gloss retention shall be minimum 50 percent of the original gloss value. There will be no appreciable change in colour' *for* 'Difference in gloss and colour between immersed and unimmersed area of paint film shall be minimum'.

(*Page* 2, *Table* 1) — Add at the end of the table:

'NOTE — Test Panels shall be kept at 70°C for hard drying.'

(*Page* 3, *clause* **6.1.1**) — Substitute 'Any sediment formed in the container shall be mixed thoroughly, preferably with power driven stirrer to form homogeneous paint' *for* 'Any sediment that does form must be easy to stir up again in order to give a homogeneous paint'.

(*Page* 3, *Annex* A, *line* 11) — Substitute 'Sec 1 : 1986' *for* 'Sec 1 : 1987'.

(CHD 031)

Reprography Unit, BIS, New Delhi, India

Indian Standard

POLYURETHANE FULL GLOSS ENAMEL (TWO PACK) – SPECIFICATION

1 SCOPE

1.1 This standard prescribes requirements and methods of sampling and test of a two-pack full gloss polyurethane enamel, intended to be used for the protection of exterior of railway coaches, diesel and electric locomotive against atmospheric corrosion.

1.1.1 It is primarily suitable for application by spraying (conventional air/airless). It may also be applied by brush for touching up small areas.

1.1.2 The material is intended to be used as a top coat in painting system for the protection of exterior of railway coaches, etc, involving wet and damp areas, high humidity, coastal, marine and industrial fall out. Polyurethane paints shall be suitable for use in those exterior applications where it is desirable to retain colour and gloss for long periods of time in addition to providing excellent chemical and corrosion resistance.

2 REFERENCES

The Indian Standards listed in Annex A are the necessary adjuncts to this standard.

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 1303 : 1983 and the following shall apply.

3.1.1 *Component*

Each of the two parts of the paint which when mixed together, form a pigmented polyurethane paint.

3.1.2 *Paint*

The mixture of the two components in the proportion recommended by the manufacturer.

4 REQUIREMENTS

4.1 Composition

The paint shall consist essentially of two components, enamel and hardener or catalyst solution to be mixed in such simple proportion preferably by volume to satisfy all the requirements of this standard.

4.1.1 An enamel shall consist of (i) an appropriate polyol, and (ii) pigments, extenders, solvents and additives.

4.1.2 Hardener or catalyst solution shall consist of (i) an aliphatic polyisocyanate, and (ii) solvents and additives.

NOTE — To determine whether the polyisocyanate is aliphatic or aromatic in nature, the test shall be carried out as prescribed in Annex B.

4.1.3 The mixture of base and hardener shall be allowed to mature for 20 min at 27±2°C. The mixture must be consumed within 4 hours after mixing.

4.2 The material shall also comply with the requirements given in Table 1.

5 TESTS

5.1 Unless specified otherwise, tests shall be conducted as prescribed in IS 101. References to the relevent parts of that standard are given in col 5 of Table 1.

5.2 The preparation of metal panels shall be as per IS 101 (Part 1/Sec 3) : 1986.

5.3 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (*see* 1070 : 1977) shall be employed.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

5.4 The two component polyurethane finish enamel shall be mixed in the ratio recommended by the manufacturer of the paint before conducting the test or tests. Where the enamel is required to be applied on panels, it shall be done so by using suitable spraying apparatus.

5.5 The spray gun shall be thoroughly cleaned before use. Correct size of nozzle and air-cap shall be fitted to it. The air pressure shall be adjusted in accordance with the viscosity of the material to be sprayed. An even and uniform coat having a dry film thickness of minimum 35 microns has to be obtained. The film thickness shall be determined by the method prescribed in Annex C.

Table 1 Requirements for Full Gloss Polyurethane Enamel (Two-Pack)

(*Clause* 4.2)

Sl No.	Characteristic	Requirement	Methods of Test	
			Annex	Ref to IS No.
(1)	(2)	(3)	(4)	(5)
i)	Drying time			101 (Part 3/Sec 5) : 1987
	a) Surface dry, *Max*	3 Hours		
	b) Hard dry, *Max*	8 Hours		
ii)	Consistency	Smooth and uniform and suitable for spray application	—	101 (Part 1/Sec 5)*
iii)	Finish	Smooth and full glossy	—	101 (Part 3/Sec 4) : 1987
iv)	Colour	Close match to be specified IS colour or to an agreed colour	—	101 (Part 4/Sec 2) : 1989
v)	Dry film thickness, *Min*	35 microns	C	—
vi)	Volume solids, *Min*	40 percent	D	—
vii)	Scratch hardness	No such scratch as to show bare metal	—	101 (Part 5/Sec 1) : 1988
viii)	Flexibility and adhesion	No visible damage or detachment of film	—	101 (Part 5/Sec 2) : 1988
ix)	Flash point (for each component)	Not below 20°C	—	101 (Part 1/Sec 6) : 1987
x)	Fineness of grind, *Max*	10 microns	—	101 (Part 3/Sec5) : 1987
xi)	Pot life, 27±2°C, *Min*	4 Hours	E	—
xii)	Gloss at 45° angle of incidence, *Min*	52	—	101 (Part 4/Sec 4) : 1988
xiii)	Weight in kg/10 1, *Min*	9	—	101 (Part 1/Sec 7) : 1987
xiv)	Accelerated tests:			
	a) Resistance to sulphuric acid	Shall not show any signs of blistering, wrinkling and lifting. Difference in gloss and colour between immersed and unimmersed area of paint film shall be minimum	F	—
	b) Resistance to caustic potash	do		
	c) Resistance to oil	do		
	d) Resistance to solvents	do		
xv)	Durability test:	*Rating*		
	a) Out-door exposure			
	b) Accelerated weathering test	Chalking 10 Checking 10 Cracking 10 Flaking 10 Spotting 10 Blistering 10 Colour change 7-8 Gloss The film shall have a minimum gloss retention of 90 percent of its original value Corrosion No corrosion (*see* 3.4 of IS 8662 :1978)	G	—
xvi)	Keeping properties	Not less than one year	—	101 (Part6/Sec 1) : 1988

ANNEX B

(*Clause* 4.1.2)

METHOD OF IDENTIFYING AROMATIC AND ALIPHATIC ISOCYANATES

B-0 GENERAL

B-0.1 Aliphatic polyisocyanates show no colouration while aromatic polyisocyanates show a light brown to a dark reddish brown colouration with hydrogen peroxide.

B-1 REAGENTS

B-1.1 Acetone

B-1.2 3 percent hydrogen peroxide solution in acetone.

B-2 PROCEDURE

B-2.1 Prepare an approximately 40-50 percent solution of the polyisocyanate in acetone. To 50 ml of this solution, stir 1 ml of 3 percent hydrogen peroxide solution. Allow it to stand for 5-I0 min.

B-2.2 The development of any light brown to a dark reddish brown colour indicates aromatic polyisocyanates. No colour indicates aliphatic polyisocyanates.

ANNEX C

[*Clause* 5.5, and *Table* 1, *Sl No.* (v)]

DETERMINATION OF PAINT FILM THICKNESS

C-0 GENERAL

C-0.1 This specifies non-destructive methods for determining the thickness of dry paint films on metallic substrates. It is, therefore, primarily intended for use in checking the thickness of paint films on painted articles.

C-1 APPARATUS

C-1.1 Electromagnet

This type of instrument, requires a supply of electrical power and incorporates means of stabilizing the supply to an electromagnetic head.

C-2 PROCEDURE

C-2.1 The head is placed on an unpainted metal surface similar in nature to that bearing the paint film under test. A reading is taken and the operation repeated on the painted surface. The scale on the instrument is calibrated to indicate the thickness of the paint film shown by the difference between two readings.

ANNEX D

[*Table* 1, *Sl No.* (vi)]

DETERMINATION OF VOLUME SOLIDS

D-0 GENERAL

D-0.1 This method is intended to provide a measure of the volume of dry coating obtainable from a given volume of liquid coating. This volume is considered to be the most equitable means of comparing the coverage and the wet film thickness of the given paint.

D-1 APPARATUS

D-1.1 Analytical Balance — Sensitive to 0.1 mg.

D-1.2 Stainless Steel Disc

60 mm diameter and 0.70 mm thickness with a small hole 2 to 3 mm from the edge. A fine wire such as chromel is attached through the hole for suspending the disc in a liquid.

D-1.3 Weight Box

D-1.4 Beaker — 1 litre.

D-1.5 Mass per Litre Cup

D-1.6 Hot Air Oven — Capable to maintain 90±2°C.

D-2 PROCEDURE

D-2.1 Dry the disc in an oven at 90°C for 10 minutes and cool Weigh the disc in air. Let it be W_1 grams.

D-2.2 Suspend the disc in water and weigh again. Let it be W_2 grams.

D-2.3 Calculate the volume of the disc V as follows:

$$V = \frac{W_1 - W_2}{d}$$

where

d is the density of the water at room temperature.

D-2.4 Determine the weight of non-volatile content of the liquid coating material by drying a known amount of paint at 90°C for 3 hours. Let it be W grams.

D-2.5 Determine the specific gravity of the paint to the nearest 0.001 g/ml by using mass per litre cup. Let it be P.

D-2.6 Dip the disc in the paint sample for 10 minutes and take out the disc. Allow the excess coating material to drain off. Blot the coating material off the bottom edge of the disc so that beads or drops do not dry on the bottom edge of the disc. Dry the disc at 90°C for 3 hours and cool. Weigh the coated disc in air. Let it be W_3 grams.

D-2.7 Suspend the coated disc in water and weigh again. Let it be W_4 grams.

D-2.8 Calculate the volume of the coated disc V_1 as follows:

$$V_1 = \frac{W_3 - W_4}{d}$$

where

d is the density of water at room temperature.

D-2.9 Calculate the volume of the dried coating as follows:

Volume of dried coating = $V_1 - V$
(Vd)

D-2.10 Calculate the volume of wet coating as follows:

$$V_w = \frac{W_3 - W_1}{W \times P}$$

where

W = grams of non-volatile matter in 1 g of wet coating.

D-2.11 Calculate the percent volume solids of the paints as follows:

$$\frac{V_1 - V}{V_w} \times 100 \text{ OR } \frac{V_d}{V_w} \times 100$$

D-2.12 The percent volume solids of a paint is related to the covering capacity and film thickness in the following manner:

a) **Theoretical coverage (m^2/l) =**

$$\frac{\text{Percent volume solids}}{\text{Dry film thickness (microns)}} \times 10$$

b) **Wet film thickness (microns) =**

$$\frac{\text{Dry film thickness (microns)}}{\text{Percent volume solids}} \times 100$$

ANNEX E

[*Table* 1, *Sl No.* (xi)]

DETERMINATION OF POT LIFE

E-1 GENERAL

E-1.1 The time taken to reach to end of working life from the original viscosity shall be considered as the pot life of the material.

E-2 PROCEDURE

E-2.1 Condition the components of the coating for one hour at 27°C and mix immediately in the proper ratio to fill the can to be approximately 1 cm of the top. The lid should be loosely placed on the can.

E-2.2 Measure the viscosity initially and every hour thereafter, as prescribed in IS 101 (Part 1/Sec 5).

NOTE — The interval may be shortened, if desired.

E-2.3 Near the end of the coating's working life, the viscosity builds up rapidly. When it appears that the coating may be too viscous to spray, remove a small portion and add the appropriate thinner. If the paint can still be thinned, the end of the working life has not been reached.

E-2.4 The end of the working life is reached when the paint gels, becomes stringy or cannot be thinned for application.

E-3 Report the working life as pot life of the period.

ANNEX F

[*Table* 1, *Sl No.* (xiv)]

ACCELERATED TESTS

F-1 GENERAL

F-1.1 These tests of chemical resistance, are included to assure the customer that the coating contains a sufficiency of cured resin to exhibit the long term requirements.

F-2 PROCEDURE

F-2.0 Prepare the panels as per Annex H. For the immersion tests as in **F-2.1** to **F-2.3**, prepare and paint both sides of the panels and protect the edges of the panels by sealing with a chlorinated rubber paint.

F-2.1 Resistance to Sulphuric Acid

Immerse 3/4th of the panel in 30 percent sulphuric acid for 24 hours. Remove the panel, wash in running fresh water and allow it to dry for an hour. Record the observation.

F-2.2 Resistance to Caustic Potash

Immerse 3/4th of the panel in 20 percent solution of potassium hydroxide for 24 hours. Remove the panel, wash in running fresh water, allow it to dry for an hour. Record the observation.

F-2.3 Resistance to Oil

Immerse 3/4th of the panel in a mineral lubricating oil (*see* **19.1** of IS 101 : 1964) for 24 hours.

Remove the panel and wipe the excess oil with cotton, wash it with mineral turpentine and allow to dry for 30 minutes. Record the observation.

F-2.4 Resistance to Solvents

Test one panel each for resistance to xylene, ethanol and acetone respectively. Take a clean white sterilized cotton and soak it in the solvent and place it on the painted panel without squeezing the cotton. Immediately cover the soaked cotton with a suitable watch glass and leave it for 6 hours. Remove the watch glass and the soaked cotton, wipe the area with a clean dry cotton. Record the observation immediately.

ANNEX G

[*Table* 1, *Sl No.* (xv)]

DURABILITY TEST

G-1 GENERAL

G-1.1 Both sides of the panels must be prepared and painted as per Annex J for normal outdoor exposure test as well as accelerated weathering test.

G-2 NORMAL OUT-DOOR EXPOSURE TEST

G-2.1 Expose the test panels in the open in duplicate at an angle of 45° facing south. The duration of test shall be for a period of 12 months. The test shall be started from any month in a calendar year. Examine the condition of the exposed films at monthly intervals for the first quarter and thereafter quarterly for the rest of the period for the following characteristics:

a) Gloss
b) Colour
c) Checking; cracking and flaking
d) Chalking
e) Spotting
f) Blistering

G-2.2 Wash the right hand half of the surface of the two test panels with 5 percent caustic soda solution followed by 5 percent hydrochloric acid solution and subsequent thorough rinsing with water. Wipe the panel with a clean soft cloth. Examine the same half of the test panels at each examination. As an aid in the examination, a magnifying glass may be used, but the valuation shall be based on an assessment with the unaided eye. At the end of the stipulated period for durability test, examine the two halves of the test panels. The sample shall be considered satisfactory if the material surface underneath as well as condition of the film in both the halves, the one washed periodically as well as the one washed only

for the final examination is satisfactory. The requirements of this test shall be taken to have been satisfied if performance in respect of the characteristics as noted in **A-3.2** and **A-3.4** of IS 8662 : 1978 is within the limits specified in Table 1.

G-3 ACCELERATED WEATHERING TEST

G-3.1 Carry out the test for 1 000 hours in a xenon arc type weatherometer (with rotating day/night device) with a cycle of 3 minutes rainfall and 17 minutes dry period.

The requirements of this test shall be taken to have been satisfied if performance in respect of the characteristics as noted in **A-3.2** and **A-3.4** of IS 8662 : 1978 is within the limits specified in Table 1.

ANNEX H

(*Clause* F-2.0)

PREPARATION OF PAINTED PANELS FOR ACCELERATED TESTS

H-1 The preparation of panels shall generally be in accordance with IS 101 (Part 1/Sec 3): 1986.

H-2 Apply one coat of epoxy zinc phosphate primer (two-pack) at minimum 35 microns dry film thickness by spraying and allow to dry for at least 6 hours and not more than 24 hours. Dry rub with emery paper No. 400 and wipe clean with a dry soft cloth.

H-3 Apply one coat of epoxy surfacer (two-pack) at minimum 35 microns dry film thickness by spraying and allow to dry for at least 6 hours and not more than 24 hours. Wet rub with water-proof emery paper No. 400 and allow to dry.

H-4 Apply one coat of full gloss polyurethane enamel (two-pack) at minimum 35 microns dry film thickness by spraying and allow to air dry for 7 days.

ANNEX J

(*Foreword*)

HEALTH HAZARDS AND SAFETY MEASURES

Use of polyurethane paints generally presents a two-fold potential hazard, toxic hazards and fire hazards.

Toxic effects through the lungs and the skin occur frequently in the industrial usage of paints. The best guide of comparative values of ingestion toxicity is the LD 50 value. It refers to the lethal doses of toxic substance which can kill 50 percent of one class of animal in test. The LD 50 value for polyisocyanates is much lower when compared to the LD 50 value of cyanides. Another guide of comparative values of inhalation is the threshold limit value (TLV). The TLV for monomeric di-isocyanates has been fixed up at 0.02 ppm. Therefore, spraying of polyurethane paints calls for safety precautions in the form of proper ventilation, proper exhaust facilities and hand-gloves for the spray painters. However, it would be an ideal painting practice to go in for proper spray booth.

As far as fire hazards are concerned, all solvents based paints are known for their fire-risks. This can be eliminated by providing good ventilation so as to avoid vapour air mixture which are flammable and also by not exposing the paint vapours to sources of static electricity, sparks or flames.

The polyurethane coatings are as safe to handle as any other solvent based paints, provided general industrial hygiene principles are followed.

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Doc : No. CHD 020 (9357)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at Printwell Printers, Aligarh, India

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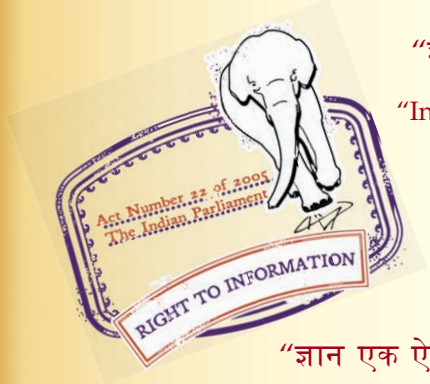
"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 13238 (1991): Epoxy based zinc phosphate primer (two pack) [CHD 20: Paints, Varnishes and Related Products]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS 13238 : 1991
(Reaffirmed - 2012)

भारतीय मानक

एपॉक्सी आधारित जस्ता फास्फेट प्राइमर (दो पैक) — विशिष्टि

Indian Standard

EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK) — SPECIFICATION

UDC 667.638.2

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1991 Price Group 3

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints (Other than Industrial Paints) and Allied Products Sectional Committee had been approved by the Chemical Division Council.

The paint obtained by the in two packs is used as a highly protective anti-corrosive primer on steel surfaces for providirg a much higher degree of protection than conventional single pack primer.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)' The number of significant places retained in the rcunded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 3 OCTOBER 2007
TO
IS 13238 : 1991 EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK) — SPECIFICATION

(*Page* 2, *Table* 1, *Sl No.* 6, *col* 2) — Delete 'by mass, *Min*'.

(*Page* 2. *Table* 1, *Sl No.* 10, *col* 2) — Add the following after 500 hours:

'with single coat dry film thickness of 35-45 micron'.

(*Page* 2, *Table* 1, *Sl No.* 11, *col* 2) — Add the following after 500 hours:

'with single coat dry film thickness of 35-45 micron'.

(CHD 20)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 APRIL 2006
TO
IS 13238 : 1991 EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK) — SPECIFICATION

(*Page* 2, *Table* 1, *col* 2, *Sl No,* 10) — Substitute 'Resistance to salt spray at 40 ± 5 microns DFT, 500 hours' *for* 'Resistance to salt spray 500 hours'.

(*Page* 2, *Table* 1, *col* 2, *Sl No.* 11) — Substitute 'Protection against corrosion under condition of condensation at 40±5 microns DFT, 500 hours' *for* 'Protection against corrosion under condition of condensation, 500 hours'.

(CHD 20)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 1 DECEMBER 1994
TO
IS 13238 : 1991 EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK) — SPECIFICATION

(*Page* 2, *Table* 1) — Add the following after Sl No. (i)(b):

Sl No.	Characteristic	Requirement	Method of Test, Ref to	
			Annex	IS No.
(1)	(2)	(3)	(4)	(5)
c)	Hard dry, 70°C, *Max*	30 min, with 15 min flash off time	—	101 (Part 3/Sec 1) : 1986 (*see* Note)

(*Page* 2, *Table* 1, *col* 2) — Renumber Sl No. '1 (c)' as '1 (d)'.

(*Page* 2, *Table* 1, *col* 2, *Sl No.* 7) — Substitute '1 500 g' *for* '1 200 g'.

(*Page* 2, *Table* 1, *col* 3, *Sl No.* 4) — Substitute 'offwhite/grey' *for* 'grey'.

(*Page* 2, *Table* 1, *col* 3, *Sl No.* 14) — Substitute 'Not less than *Twelve* months from date of manufacture' *for* 'Not less than *Nine* months'

(*Page* 2, *Table* 1) — Add the following note at the end of the table:

'NOTE — Test Panels shall be kept at 70°C for hard drying.'

(*Page* 2, *clause* 6.1.1)— Substitute 'Any sediment formed in the container shall be mixed thoroughly preferably with power driven stirrer to form homogeneous paint' *for* 'Any sediment that does form must be easy to stir up again in order to give a homogeneous paint'.

(CHD 031)

Reprography Unit, BIS, New Delhi, India

Indian Standard

EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK) — SPECIFICATION

SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for two pack epoxy based zinc phosphate primer, intended to be used for the protection of exterior of Railway Coaches, wagons and bridges.

1.1.1 The material is intended to be used as an anti-corrosive primer in epoxy/polyurethane paint System over adequately prepared exterior eel surfaces of railway coaches, etc.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 1303 : 1983 and the following shall apply.

3.1.1 *Component*

Each of the two parts of the paint which when mixed together, forms an epoxy based zinc phosphate priming paint.

3.1.2 ***Paint***

The mixture of the two components in the proportion recommended by the manufacturer.

4 REQUIREMENTS

4.1 Composition

The paint shall consist essentially of two components, base and hardner in such simple ratio preferably by volume to satisfy all the requirements of this standard.

4.1.1 Base shall consist of : (a) epoxy resin and (b) a pigment.

4.1.1.1 Epoxy resin, used in the formulation of the paint, shall have the weight per epoxy equivalent of 400-600 on non-volatile vehicle content, when tested according to **4** of IS 9162 : 1979.

4.1.1.2 The paint shall contain a minimum of 40 percent by mass of pigment on the mass of paint. The pigment shall contain a minimum of 16 percent by mass of zinc phosphate in the total pigment content apart from other pigments such as extenders, rust inhibitors, etc, when tested according to **27** of IS 101 (Part 8/Sec 2) : 1990 using the following extraction mixture:

i) Methyl iso-butyl ketone (*see* IS 9850 : 1981) or methyl ethyl ketone or a mixture of both in the ratio 1:1, by volume;	25 parts
ii) Xylene; and	50 parts
iii) Acetone (*see* IS 170 : 1986)	25 parts

4.1.2 Hardner shall be liquid type, such as an aliphatic amine, an aliphatic or aromatic amine adduct, a polyamide or amidopolyamine. It shall react with epoxy resin at normal ambient temperature.

4.1.3 The mixture of base and hardner shall be allowed to mature for 20 minutes at 27 ± 2°C. This mixture must be consumed within 4 hours after mixing.

4.2 The material shall comply with the requirements given in Table 1.

5 TESTS

5.1 Unless specified otherwise, tests shall be conducted as prescribed in specifications mentioned in col 4 of Table 1.

5.2 The preparation of metal panels shall be according to IS 101 (Part 1/Sec 3) : 1986.

5.3 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070 : 1977) shall be employed.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

5.4 All the tests shall be conducted at 27 ± 2°C and a relative humidity at 65 ± 5 percent in a well ventilated chamber free from draught and dust.

5.5 The two component epoxy zinc phosphate primer shall be mixed in the ratio recommended by the manufacture of paint, before conducting the tests. Where the primer is required to be applied on panels, it shall be done so by using suitable brush/spray apparatus.

6 PACKING AND MARKING

6.1 Packing

Unless otherwise agreed to between the purchaser and the supplier, the material shall

Table 1 Requirements for Apoxy Based Zinc Phosphate Primer (Two Pack)
(Clause 4.2)

Sl No.	Characteristics	Requirements	Methods of Test Ref to IS No./ Annex
(1)	(2)	(3)	(4)
1.	Drying time		101 (Part 3/Sec 1) : 1986
	a) Surface dry, *Max*	4 hours	
	b) Hard dry, *Max*	16 hours	
	c) Curing time, *Max*	7 days	
2.		Smooth uniform and suitable for brush/spray application	101 (Part 1/Sec 5) : 1991
3.	Finish	Smooth matt and egg shell flat	101 (Part 3/Sec4): 1987
4.	Colour	Grey	101 (Part 4/Sec 2) : 1989
5.	Dry film thickness per coat, *Min*		B
	a) By brushing	30 micron	
	b) By airless spray	35-40 micron	
6.	Volume solids, percent by mass, *Min*	40	C
7.	Scratch hardness with 1 200 g load	No scratch as to show bare metal	101 (Part 5/Sec 1): 1988
8.	Flexibility and adhesion	No visible damage or detachment of the film	101 (Part 5/Sec 2) : 1988
9.	Flash point	Above 20°C	101 (Part 1/Sec6): 1987
10.	Resistance to salt spray 500 hours	No sign of corrosion and no sign of deterioration	101 (Part 6/Sec 1): 1988
11.	Protection against corrosion under condition of condensation, 500 hours	do	do
12.	Mass in kg/10 litres, *Min*	13.0	101 (Part 1/Sec 7) : 1987
13.	Pot life at 27 ± 2°C, *Min*	4 hours	D
	Max	16 hours	
14.	Keeping properties	Not less than *Nine* months	101 (Part 6/Sec 2) : 1989

be packed in metal containers conforming to IS 1407 : 1980 and IS 2552 : 1979.

6.1.1 Each component as delivered shall be free of gel, coarse particles, skins, foreign matter and sediments. Any sediment that does form must be easy to stir up again in order to give a homogeneous paint.

6.2 Marking

Each container shall be marked with the following:

a) Name of the material with component's name and induction period;

b) Indication of the source of manufacture;

c) Volume of the material;

d) Safe storage period;

e) Month and year of manufacture:

f) Mixing proportion recommended for use; and

g) Other instructions for safe handling and use of the material.

7 SAMPLING

7.1 Representative samples of the material shall be drawn according to 6 of IS 101 (Part 1/Sec 1): 1986.

7.2 Criteria for Conformity

7.2.1 Drying time and film thickness shall be tested on at least two samples taken from different containers selected according to **7.1.** For lot size above 1 000 kg, this shall be minimum 3. For the rest of the characteristics, tests shall be conducted on one composite sample prepared from individual samples taken from different containers in the sample.

7.2.2 There shall be no failure in respect of any test if the lot is to be considered conforming to the requirements of this specification.

ANNEX A
(*Clause* 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
101 (Part 1/ Sec 1) : 1986	Methods of sampling and test for paints, varnishes and related products: Part 1 Test on liquid paints (general and physical), Section 1 Sampling (*third revision*)
Sec 2) : 1987	Section 2 Preliminary examination and preparation of samples for testing (*third revision*)
Sec 3) : 1986	Section 3 Preparation of panels (*third revision*)
Sec 5) : 1991	Section 5 Consistency
Sec 6) : 1987	Section 6 Flash point (*third revision)*
Sec 7) : 1987	Section 7 Mass per 10 litres (*third revision*)
(Part 3/ Sec 1) : 1986	Part 3 Test on paint film formation, Section 1 Drying time (*third revision*)
Sec 4 : 1987	Section 4 Finish) *third revision*)
(Part 5/ Sec 1) : 1988	Part 5 Mechanical test on paint films, Section 1 Hardness test
Sec 2) : 1988	Section 2 Flexibility and adhesion
(Part 6/ Sec 1) : 1988	Part 6 Durability tests on paint films, Section 1 Durability under conditions of condensation
Sec 2 : 1989	Section 2 keeping properties (*third revision*)
(Part 8/ Sec2) : 1990	Part 8 Tests for pigments and other solids, Section 2 Pigments and non-volatile (*third revision*)
170 : 1986	Acetone (*third revision*)
1070 : 1970	Water for general laboratory use (*second revision*)
1303 : 1983	Glossary of terms relating to paints (*second revision*)
1407 : 1980	Round paint tins (*second revision*)
2552 : 1979	Steel drums (galvanized and ungalvanized) (*second revision*)
9162 : 1979	Methods of tests for epoxy resins, hardners and epoxy resin composition for floor topping
9850 : 1981	Methyl *iso* butylketone
10897 : 1984	Zinc phosphate pigments for paints

ANNEX B
(*Table* 1, *Sl No.* 5)

DETERMINATION OF PAINT FILM THICKNESS

B-0 GENERAL

B-0.1 This specifies non-destructive methods for determining the thickness of dry paint films on metallic substrates. It is, therefore, primarily intended for use in checking the thickness of paint films on painted articles.

B-1 APPARATUS

B-1.1 Electromagnet

This type of instrument, requires a supply of electrical power and incorporates means of stabilizing the supply to an electromagnetic head

B-2 PROCEDURE

B-2.1 The head is placed on an unpainted metal surface similar in nature to that bearing the paint film under test. A reading is taken and the operation repeated on the painted surface. The scale on the instrument is calibrated to indicate the thickness of the paint film shown by the difference between two readings.

ANNEX C
(*Table* 1, *Sl No.* 6)

DETERMINATION OF VOLUME SOLIDS

C-1 GENERAL

C-1.1 This method is intended to provide a measure of the volume of dry coating obtainable from a given volume of liquid coating. This volume is considered to be the most equitable means of comparing the coverage and the wet film thickness of the given paint.

C-2 APPARATUS

C-2.1 Analytical Balance — Sensitive to 0.1 mg.

C-2.2 Stainless Steel Disc

60 mm diameter and 0.70 mm thickness with a small hole 2 to 3 mm from the edge. A fine wire such as chromel is attached through the hole for suspending the disc in a liquid.

C-2.3 Weight Box

C-2.4 Beaker — 1 litre.

C-2.5 Mass per Litre Cup

C-2.6 Hot Air Oven — Capable to maintain 105 ± 2°C.

C-3 PROCEDURE

C-3.1 Dry the disc in an oven at 105°C for 10 minutes and cool. Weigh the disc in air. Let it be W_1 grams.

C-3.2 Suspend the disc in water and weigh again. Let it be W_2 grams.

C-3.3 Calculate the volume of the disc V as follows:

$$V = \frac{W_1 - W_2}{d}$$

where

d = the density of the water at room temperature.

C-3.4 Determine the weight of non-volatile content of the liquid coating material by drying a known amount of paint at 105°C for 3 hours. Let it be W grams.

C-3.5 Determine the specific gravity of the paint to the nearest 0.001 g/ml by using mass per litre cup. Let it be p.

C-3.6 Dip the disc in the paint sample for 10 minutes and take out the disc. Allow the excess coating material to drain off. Blot the coating material off the bottom edge of the disc so that beads or drops do not dry on the bottom edge of the disc. Dry the disc at 105°C for 3 hours and cool. Weigh the coated disc in air. Let it be W_3 grams.

C-3.7 Suspend the coated disc in water and weigh again. Let it be W_4 grams.

C-3.8 Calculate the volume of the coated disc V_1 as follows:

$$V_1 = \frac{W_3 - W_4}{d}$$

where

d = the density of water at room temperature.

C-3.9 Calculate the volume of the dried coating as follows:

Volume of dried coating = $V_1 - V$ (V_d)

C-3.10 Calculate the volume of wet coating as follows:

$$V_W = \frac{W_3 - W_1}{W \times P}$$

where

W = grams of non-volatile matter in 1 g of wet coating.

C-3.11 Calculate the percentage volume solids of the paints as follows:

$$\frac{V_1 - V}{V_w} \times 100 \text{ OR } \frac{V_d}{V_w} \times 100$$

C-3.12 The percent volume solids of a paint is related to the covering capacity and wet film thickness in the following manner:

a) Theoretical coverage (m^2/l)

$$= \frac{\text{Percent Volume Solids}}{\text{Dry film thickness (microns)}} \times 10$$

b) Wet film thickness (microns)

$$= \frac{\text{Dry film thickness (microns)}}{\text{Percent Volume Solids}} \times 100$$

ANNEX D

(*Table* 1, *Sl No.* 13)

DETERMINATION OF POT LIFE

D-1 GENERAL

D-1.1 The time taken to reach to end of working life from the original viscosity shall be considered as the pot life of the material.

D-2 PROCEDURE

D-2.1 Condition the components of the coating for one hour at 27°C and mix immediately in the proper ratio to fill the can to be approximately 1 cm of the top. The lid should be loosely placed on the can.

D-2.2 Measure the viscosity initially and every hour thereafter, as prescribed in IS 101 (Part 1/ Sec 5).

NOTE — The interval may be shortened, if desired.

D-2.3 Near the end of the coating's working life, the viscosity builds up rapidly. When it appears that the coating may be too viscous to spray, remove a small portion and add the appropriate thinner. If the paint can still be thinned, the end of the working life has not been reached.

D-2.4 The end of the working life is reached when the paint gels, becomes stringy or cannot be thinned for application.

D-3 Report the working life as pot life of the period.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promoto harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Revision of Indian Standards

Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference :

Doc : No. CHD 020 (9685)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at Swatantra Bharat Press, Delhi, India

भारतीय मानक

दो घटक जस्ता ईथाइल सिलिकेट प्राइमर — विशिष्टि

Indian Standard

ZINC ETHYL SILICATE PRIMER, TWO COMPONENTS — SPECIFICATION

ICS 25.220.40; 87.020

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 2001

Price Group 6

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Industrial Paints Sectional Committee had been approved by the Chemical Division Council.

Zinc rich primers find a wide range of applications for corrosion protection of iron and steel. These can be used alone but are usually employed as a primer coat as a part of the protective system for long term corrosion protection. Zinc pigmented primers are also used for fabrication primers (shop primers) for the protection of abrasive blast cleaned steel plates and fabricated components of ships and other structures. Repair of damaged galvanized and metallic zinc sprayed coatings is carried out by using metallic zinc rich primers.

The standard has been prepared with the aim to cater for the requirements of zinc rich paints for use as primers and prefabrication paints having different degree of corrosion protection.

The satisfactory performance of zinc rich primers depends largely on their capacity to attain close electrical contact between zinc particles and iron or steel surface to be protected. The close electrical contact permits in achieving adequate galvanic protection of the steel substrate especially under marine conditions. To ensure such electrical contact it becomes essential to remove all mill scale, rust and any other contamination from the steel surface to be painted. The zinc rich primers, therefore, shall be applied only to very carefully prepared steel preferably abrasive blast cleaned surface conforming to Sa 2.5/Sa 3 quality to Swedish standard. It is important to control the surface roughness. This is mainly achieved by the selection of correct size of grit or shot and appropriate air pressure. The profile height obtained should lie between 50-75 microns.

While formulating this standard, considerable assistances have been obtained from SSPC - Paint 20, November 1982, Systems and Specification, Steel Structure Painting Manual, Part 2 of Steel Structure Painting Council, Pittsburgh, PA (USA).

This standard also provides informative guidance for deciding a testing programme to help vendors (*see* Annex G).

The committee responsible for the formulation of this standard is given in Annex H.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of specified value in this standard.

Indian Standard

ZINC ETHYL SILICATE PRIMER, TWO COMPONENTS — SPECIFICATION

1 SCOPE

This standard prescribes requirements, sampling and method of test for zinc ethyl silicate primer. This material shall be used for the painting of steel paint equipments, by spraying, where corrosion protection, chemical resistance under marine atmospheric condition, abrasion and heat resistance are required.

2 REFERENCES

The Indian Standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

3 TERMINOLOGY

For the purpose of this standard the terms and definitions used in IS 1303 shall apply.

4 REQUIREMENTS

4.1 Composition

The material complying with this standard shall be ethyl silicate pigmented with zinc metal *see* IS 14355. The manufacturer shall specify the principal type of binder used in the pigmented curing agent. The total metallic zinc content in non-volatile portion of the shop coat primer shall be 65 percent *Min* and for the main coat primer 75 percent *Min* when tested as per Annex B.

4.2 Weight per 10 litre of the mixed paint shall be 13 kg, *Min* for shop coat and 20 kg, *Min* for main coat and shall be determined in accordance with IS 101 (Part 1/Sec 7). Variation shall be within + 3 percent.

4.3 Solids percent by weight of the mixed paint shall be 50 *Min* for shop coat and 68 *Min* for main coat and shall be determined in accordance with IS 101 (Part 2/Sec 2). Variation shall be within + 2 units.

4.4 Keeping Properties

The liquid portion of the multi-component paint shall not show thickening, curdling, gelling or hard caking after being stored unmixed for six months from the date of delivery in a tightly covered unopened container at a temperature of 27 ± 2°C [*see* IS 101 (Part 6/sec 2)].

4.5 The material shall conform to the requirements given in Table 1.

5 TESTS

5.1 Unless specified otherwise, tests shall be conducted as prescribed in IS 101, preferably on the blasted panels. Reference to the relevant sections of the standard are given in col 6 of Table 1.

5.2 The preparation of metal panels shall be according to IS 101 (Part 1/Sec 3).

5.3 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be employed.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

6 PACKING AND MARKING

6.1 Packing

It shall ensure that the quality does not deteriorate during storage and shall be as agreed to between purchaser and supplier.

6.2 Marking

6.2.1 Each container shall be marked with the following information:

a) Indication of the source of manufacture,

b) Batch No. or Lot No. and month and year of manufacture,

c) Date of expiry,

d) Mass of the material,

e) Name of the material (both the component to be mentioned including type and pack), and

f) The caution label 'FLAMMABLE' together with the corresponding symbol for labelling dangerous goods as given in Fig. 5 of IS 1260 (Part 1).

6.2.2 *BIS Certification Marking*

The product may also be marked with the Standard Mark.

Table 1 Requirements of Zinc Ethyl Silicate Primer

(*Clause* 4.5)

Sl No.	Characteristics	Requirements		Method of Test, Ref to	
		for Shop Coat Primer	for Main Coat Primer	Annex	IS 101
(1)	(2)	(3)	(4)	(5)	(6)
A	**Wet Paint**				
	i) Mixing Ratio	Simple ratio as specified by the manufacturer both by weight as well as by volume		—	
	ii) Consistency	The liquid component mixed with powder/component using power stirrer shall be suitable for application by the appropriate method(s) either as such or when thinned in the proportions as specified by the manufacturer		—	Part 1/Sec5
	iii) Flash Point	Not below 13°C	Not Below 15°C		Part 1/Sec 6
	iv) Drying Time:				Part 3/Sec 1
	a) Surface dry	15 min *Max*	15 min *Max*		
	b) Hard dry	2 h *Min*	2 h *Min*		
	c) Time to top coat	24 h *Min*	24 h *Min*	C	
	v) Mud-cracking (when viewed under 10 X magnification)	The coating applied to a dry film thickness of 60 micron, *Min* shall not show any mud cracking	The coating applied to a dry film thickness of 120 micron, *Min* shall not show any mud cracking	—	
	vi) Volume solids, percent *Min* (To be determined by air drying the coated disc at room temperature for 24 h and also non-volatiles are to be estimated by air drying for 24 h)	30	60		Part 8/Sec 6
	vii) Pot life, *Min* at 30°C	6 h	4 h	D	
	NOTE — Tests from Sl No. (ii) to (vii) are for mixed paint.				
B	**Dry Coat** (To be conducted after 72 h of curing)				
	i) Dry film thickness	15-25 microns	65-75 microns		Part 3/Sec 2
	ii) Colour —	Grey (self standard)		—	Part 4/Sec 2
	iii) Finish	Smooth matt	Smooth matt		Part 5/Sec 1

Table 1 (*Concluded*)

Sl No.	Characteristics	Requirements for Shop Coat Primer	Requirements for Main Coat Primer	Method of Test, Ref to Annex	Method of Test, Ref to IS 101
(1)	(2)	(3)	(4)	(5)	(6)
iv)	Protection against corrosion under conditions of condensation	1 000 h *Min*	2 000 h *Min*		Part 6/Sec 1
v)	Salt spray test	750 h *Min*	2 000 h *Min*		Part 6/Sec 1
vi)	[1] Heat resistance test. Panel kept at 400 ±10°C for 6 h followed by plunging in cold water — Three cycles, *Min*	N.A.	The film shall not show signs of cracking, blistering or flaking		Part 7/Sec 3
vii)	Effect of welding	To pass the test	N.A.	E and F	

NOTES

1 Inorganic zinc rich primers should not be applied at relative humidities below 50 percent, without specific instructions from paint manufacturer.

2 Multiple component zinc rich paints should be applied within 4 h after mixing and should be continuously agitated during application.

[1] To be carried out at the option of users.

6.2.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*,1986 and the Rules and Regulations made thereunder. The details of the conditions under which the licence for use of the Standard Mark may be granted to the manufacturers or the producers may be obtained from the Bureau of Indian Standards.

7 SAMPLING

Representative samples of the material shall be drawn according to 6 of IS 101 (Part 1/Sec 1).

ANNEX A

(*Clause* 2.1)

LIST OF REFFERED INDIAN STANDARDS

IS No.	*Title*
101	Methods of sampling and test for paints, varnishes and related products :
(Part 1/Sec 1) : 1986	Test on liquid paints (general and physical), Section 1 Sampling (*third revision*)
(Part 1/Sec 3) : 1986	Test on liquid paints (general and physical), Section 3 Preparation of panels (*third revision*)
(Part 1/Sec 5) : 1989	Test on liquid paints (general and physical), Section 5 Consistency (*third revision*)
(Part 1/Sec 6) : 1987	Test on liquid paints (general and physical), Section 6 Flash Point (*third revision*)
(Part 1/Sec 7) : 1987	Test on liquid paints (general and physical), Section 7 Mass per 10 litres (*third revision*)
(Part 2/See 2) : 1986	Test on liquid paints (Chemical examination), Section 2 Volatile matter (*third revision*)
(Part 3/Sec 1) : 1986	Tests on paint film formation, Section 1 Drying time (*third revision*)
(Part 3/Sec 2) : 1989	Tests on paint film formation, Section 2 Film thickness (*third revision*)
(Part 3/Sec 4) : 1987	Tests on paint film formation, Section 4 Finish (*third revision*)
(Part 4/Sec 2) : 1988	Optical tests on paint films, Section 2 Colour (*third revision*)
(Part 6/Sec 1) : 1988	Durability tests, Section 1 Resistance to humidity under conditions of condensation (*third revision*)
(Part 6/Sec 2) : 1989	Durability tests, Section 2 Keeping properties (*third revision*)
(Part 7/Sec 3) : 1990	Environmental tests on paint films, Section 3 Resistance to heat (*third revision*)
(Part 8/Sec 6) : 1993	Tests for pigments and other solids, Section 6 Volume solids
266 : 1993	Sulphuric acid (*third revision*)
1070 : 1992	Reagent grade water (*third revision*)
1260 (Part1) : 1973	Pictorial marking for handling and labelling of goods : Part 1 Dangerous goods (*first revision*)
1303 : 1983	Glossary of terms relating to paints (*second revision*)
1499 : 1977	Method for charpy impact test for metals (*first revision*)
1608 : 1995	Mechanical testing of metals — Tensile testing (*second revision*)
14355 : 1996	Zinc dust pigment for paints

ANNEX B

(*Clause* 4.1)

DETERMINATION OF TOTAL ZINC

B-1 GENERAL

Two methods are prescribed. In Method 1 total zinc content in the sample is determined volumetrically using potassium ferrocyanide solution. Method 2 is the alternate method and uses EDTA method.

B-2 METHOD 1

B-2.1 Outline of the Method

Total zinc content in the sample is determined volumetrically using potassium ferrocyanide solution.

B-2.2 Reagents

B-2.2.1 *Concentrated Sulphuric Acid* — *See* IS 266.

B-2.2.2 *Ammonium Hydroxide* — 20 percent (*m/v*).

B-2.2.3 *Dilute Hydrochloric Acid* — Approximately 6 N.

B-2.2.4 *Diphenylamine Indicator*

Dissolve 1 g of diphenylamine in 100 ml of concentrated sulphuric acid. It shall be freshly prepared.

B-2.2.5 *Standard Potassium Ferrocyanide Solution*

B-2.2.5.1 Dissolve 21.12 g of potassium ferrocyanide and 0.3 g of potassium ferricyanide in one litre of water and standardize as described in **B-2.2.5.2**.

B-2.2.5.2 *Standardization of potassium ferrocyanide solution*

Weigh accurately 4 to 5 g of pure zinc in a beaker, add 60 ml of dilute hydrochloric acid and heat carefully till it dissolves completely. To facilitate dissolution about 0.02 g of iron filling free from zinc may also be added. After all the zinc has dissolved, cool, dilute and make up to one litre. Pipette out 20 ml of made up zinc solution into a 500 ml conical flask, dilute to 100 ml with water and neutralize with ammonium hydroxide, added carefully till a white precipitate appears. Add dilute hydrochloric acid drop by drop till the precipitate just dissolves and add 5 ml dilute acid in excess. Warm to 60°C, add 3 drops of diphenylamine indicator and titrate against potassium ferrocyanide solution, a precipitate is formed with deepening in colour as the end point approaches, the end point being the sudden colour change with the addition of one drop from blue voilet to a pale green colour persisting even after thorough shaking. Repeat the titration to obtain constant values. Calculate the mass of zinc equivalent to 1 ml of potassium ferrocyanide solution.

B-2.3 Procedure

Weigh about 2.5 g of the material accurately into a beaker, moisten with alcohol and dissolve in 40 ml of dilute hydrochloric acid by heating. Cool, filter, if necessary, and make up to 500 ml.

B-2.3.1 Pipette 20 ml of the made up solution into a 250-ml beaker, dilute to 50 ml and pass hydrogen sulphide for about 5 min. Keep for 10 min. Heat to 80°C. Filter and collect the filtrate in a 500-ml conical flask. Boil the filtrate till free from hydrogen sulphide. Just neutralize with ammonium hydroxide, make acidic with dilute hydrochloric acid, warm to 60°C and titrate against the standard potassium ferrocyanide soloution exactly as was done for the standardization of the ferrocyanide solution.

B-2.4 Calculation

$$\text{Total zinc (as Zn), percent by mass} = \frac{2\,500\,VF}{M}$$

where

V = volume in ml of standard potassium ferrocyanide solution used in the titration,

F = mass in g of the zinc equivalent to one ml of standard potassium ferrocyanide solution, and

M = mass in g of the material taken for the test.

B-3 METHOD 2

B-3.1 Reagents

B-3.1.1 *Concentrated Hydrochloric Acid* — Density 1.18 g/ml.

B-3.1.2 *Dilute Hydrochloric Acid* — Dilute 200 ml of the hydrochloric acid (*see* **B-3.1.1**) to 1 litre, with water.

B-3.1.3 *Sulpuric Acid* — Density 1.84 g/ml.

B-3.1.4 *Nitric Acid* — Density 1.42 g/ml.

B-3.1.5 *Ammonia Solution* — Density 0.880 g/ml.

B-3.1.6 *Buffer Solution* — Dissolve 200 g of hydroxylammonium chloride ($NH_2OH.HCl$) in approximately 300 ml of water. Dissolve 28 g of sodium hydroxide in approximately 300 ml of water. Combine the two solutions, cool and dilute 1 litre with water.

B-3.1.7 Ethylene diamine tetra acetic acid (EDTA), disodium salt, dihydrate, solution, zinc factor T, in g Zn/ml (that is 1 ml of disodium EDTA solution will form a complex with T g of zinc).

Dissolve about 20 g of disodium EDTA, dihydrate, in water and make up to 1 litre with water. Store in a polyethylene bottle.

Standardize against a 0.05 M zinc sulphate solution.

B-3.1.8 *Xylenol Orange* — 0.1 g indicator (sodium salt) in 100 ml of water.

B-3.1.9 *Bromothymol Blue* — 0.1 g in 100 ml of 96 percent ethanol (*v/v*).

B-3.2 Procedure

B-3.2.1 Weigh to the nearest 0.001 g about 1.5 g of the sample into a 250-ml beaker. Dissolve the sample in 20 ml of the hydrochloric acid (*see* **B-3.1.1**) and add 1 or 2 ml of the nitric acid (*see* **B-3.1.4**) to ensure that any lead present is dissolved. Add 5 ml of the sulphuric acid (*see* **B-3.1.3**) and evaporate strongly, until fuming. Cool then add 100 ml of water, boil for a short time and allow to stand until the following day.

B-3.2.2 Filter the solution through a sintered glass or silica crucible; wash the crucible, collecting the filtration in a 500 ml one mark volumetric flask. Make the solution up to the mark and mix thoroughly.

B-3.2.3 By means of a pipette, transfer 50 ml of the solution to a 500-ml conical flask; add 200 ml of water and 3 drops of the bromothymol blue indicator (*see* **B-3.1.9**), then add ammonia solution (*see* **B-3.1.5**) drop by drop, until the colour turns blue. Then add the hydrochloric acid (*see* **B-3.1.2**) until the red colour changes to pale yellow. After that add 20 ml of the buffer solution (*see* **B-3.1.6**) and 3 drops xylenol orange indicator (*see* **B-3.1.8**) and titrate with the disodium EDTA solution (*see* **B-3.1.7**) until the red colour changes to pale yellow.

B-3.3 Calculation

$$\text{Total zinc content (as Zn), percent by mass} = \frac{1\,000\,VT}{m}$$

where

m = mass, in grams of the test portion;

T = zinc factor in grams per millilitre, of the disodium EDTA solution ; and

V = volume, in millilitres, of the disodium EDTA solution used.

ANNEX C

[*Table* 1, *Sl No.* 1 (A), iv (b) *and* C]

DETERMINATION OF HARD DRY AND TIME TO TOP COAT

C-1 PURPOSE

To determine hard dry and time to top coat of zinc silicate coatings , with desired dry film thickness (DFT) and under standard atmospheric conditions of 27 ± 2° C and 65 ± 5 percent relative humidity.

C-2 SCOPE

This test method is applicable for checking hard dry time and time to top coat.

C-3 PREPARATION OF TEST SPECIMENS AND TEST CONDITIONS

C-3.1 Conduct test in a well ventilated room or chamber, free from dust, products of combustion, laboratory fumes and under diffused light.

C-3.2 Apply the paint on M.S. panel, blast cleaned to Sa 21/2 with a surface profile 25-40 microns by spray application at a recommended DFT.

C-3.3 Allow the coated panel to dry in a horizontal or slanting position shielded from direct air current and in absence of direct sunlight.

C-3.4 Testing should be done within an area, any point of which is not less than ½ inch (15 mm) from the film edge.

C-3.5 Testing should be done at temperature 27 ± 2°C and at relative humidity of 65 ± 5 percent.

C-4 PROCEDURE

C-4.1 Hard Dry Time

Place the test panel in a horizontal position at a height such that when the thumb is placed on the film, the arm of the operator is in a vertical line from the wrist to the shoulder. Bear down on the film with the thumb, exerting the maximum pressure of the arm, at the same time turning the thumb through an angle of 90° in plane of the film. The film is considered 'hard dry' when there is no loosening, detachment, wrinkling or other evidence of distortion of the film.

C-4.2 A quick and easy method to assess adequacy of cure for topcoating is to rub the primer with the edge of a coin. If the film burnishes, it is acceptable.

ANNEX D

[*Table* 1, *Sl No.* 1 (A), vii]

DETERMINATION OF POT LIFE OF INORGANIC ZINC SILICATE

D-1 PURPOSE

To determine the pot life of inorganic zinc silicate product.

D-2 SCOPE

This test method covers the determination of pot life by determining homogenity property after a specified period of time for all moisture cured inorganic zinc silicate type of coatings.

D-3 DEFINITION

D-3.1 Pot Life

Maximum time during which a product (two pack) should be used after they have been mixed together.

D-4 APPARATUS

D-4.1 Thermometer — graduated in 1.0° C.

D-5 SAMPLING

Take a representative samples (two components) of the product to be tested. Take sufficient quantities and mix so as to make approximately 200 ml of mixed paint.

D-6 PROCEDURE

D-6.1 Testing to be carried out at 30 ± 2°C (unless specified otherwise).

D-6.2 Mix the base and hardner in the recommended ratio so as to make approximately 200 ml of mixed paint.

D-6.3 Homogenize the mixture intermittently (at least at an interval of 1 h).

D-6.4 After regular interval (for example 1 h) observe the homogenity that is, presence of any surface skin.

D-6.5 The end of pot life is indicated by skin/crust formation.

D-7 REPORT

a) Pot life in time units, and

b) Temperature.

ANNEX E

[*Table* 1, *Sl No.* 1 (B) vii]

PROCEDURE FOR PREPARATION OF TEST PANELS

E-1 PROCEDURE

Use test panels of appropriate size. Degrease using a suitable solvent, say mineral spirit. Abrasive blast using sand or chilled iron grit. Abrade the panel with zero number emery paper to flatten the excessively higher peaks, clean with brush, degrease, dry and immediately coat with the material using suitable application technique. Care should be taken that at no time during degreasing and painting should the prepared surface be touched by hand or otherwise contaminated.

NOTE — Surface profile of the panel blast cleaned as per procedure described above lies between 25-40 microns.

ANNEX F

[*Table* 1, *Sl No.* 1 (B) vii]

DETERMINATION OF INFLUENCE ON WELDING

F-1 GENERAL

The mild steel plates coated with the prefabrication primer are welded and the weld is examined for porosity and mechanical properties along with a control weld assembly.

F-2 PROCEDURE

F-2.1 Test Plate

Use mild steel plates of size 500 mm × 150 mm × 20 mm for making the weld test assemblies. A single V-notch preparation is made on longitudinal edge of each panel.

F-2.2 Preparation of Weld Assembly

Abrasive blast two plates including the edges in accordance with **E-1** and coat them with prefabrication primer as per manufacturers instructions except that the dry film thickness shall be 40-50 microns. Allow the primer coat to dry for seven days. Prepare the test assembly by welding the plates together using appropriate consumable electrodes. Abrasive blast the control assembly plates and weld in a similar fashion.

F-2.3 Examination of Test Assemblies

The test assemblies shall be examined for the tests given below:

a) *Radiographs* : These are to have a sensitivity of better than 2 percent of the plate thickness under examination, as shown by an image quality indicator.

b) *Photo-macrographs* : These may be of actual size and are to be taken from near each end and from the centre of the weld.

c) *Face and reverse bend test* : The test specimens are to be bent by pressure round a former of diameter equal to three times the plate thickness.

d) *Impact tests* : These are to be carried out at ambient temperature on three charpy V-notch test specimens prepared in accordance with IS 1 499. The specimens are to be notched at the centre line of the weld, perpendicular to the plate suface.

e) *Tensile test* : Ultimate tensile strength shall be determined in accordance with IS 1608 keeping the weld joint in the middle of the test piece.

F-2.4 The primer shall be deemed to have passed the test if porosity in primer coated weld assemblies does not exceed 10 percent than that encountered in control weld. The results of other tests on welds with primer shall not be below the minimum specified values of control welds.

ANNEX G

(Foreword)

GENERAL PROVISIONS

G-1 SUPPLY

Unless otherwise agreed by the purchaser, the zinc-ethyl silicate primer supplied shall not differ significantly from the requirements of the specification in either composition or performance.

G-2 VENDORS CERTIFICATE

The purchaser may require a test certificate that primer complies with this specification.

G-3 The following information shall be given on the certificate:

a) Description of primer,

b) The vendor's product reference,

c) Batch identification,

d) Quantity in batch, and

e) Date of manufacture.

A certificate may relate to more than one batch.

G-4 TESTS

G-4.1 The arrangement to establish compliance of the primer with this specification and the frequency of the tests to be carried out for testing the bulk supply shall be as agreed between the purchaser and the supplier.

G-4.2 When a purchaser orders supply of primer to this standard in lots to be delivered over a period, it is not contemplated that all of the tests specified must necessarily be made on samples representative of every batch or consignment. The extent and frequency of the testing will depend on many factors and a definite schedule cannot be laid down.

G-4.3 The following classification of tests is, however, submitted for the guidance of purchasers in establishing, in consultation with manufacturers, an appropriate testing programme in relation to vendor's certification.

G-4.4 It may also provide a useful basis on which to establish a testing programme when a testing authority, acting on behalf of a purchaser, is required to examine a series of batches for compliance with this standard.

G-4.4.1 GROUP 1

Tests to be made on first batch and on every subsequent batch:

— Mass in kg per 10 litre

— Solids in percent by weight

— Consistency

— Drying time

— Pot life

— Colour

— Finish

— Total metallic zinc content

— Flash point

G-4.4.2 GROUP 2

Tests to be made on first batch and subsequently as and when agreed:

— Percent volume solids

— Protection against corrosion under condition of condensation

— Salt spray test

— Heat resistance test in case of main coat primer

— Effect of welding on shop coat primer

— Keeping qualities

ANNEX H

(Foreword)

COMMITTEE COMPOSITION

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(*Continued on page* 11)

(*Continued from page* 10)

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Member-Secretary

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Director (Chem), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act,* 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. CHD 31 (430).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at New India Printing Press, Khurja, India

ANNEXURE-A

S.L. No.	Group	MAT. CODE	Paint Description	Specs	Shade/ Color	Tentative Required QTY (in Ltr)
1	A	FU5610027969	Epoxy based Zinc Phosphate Primer to IS13238 (GREY)	IS13238	GREY	5000
2		AA5610031044	Epoxy based Finish paint to IS14209 Smoke grey to shade no. 692 of IS 5,AS PER SPECIFICATION: AA56131	AA56131	Smoke grey to shade no. 692 of IS 5	5000
3		AA5610012015	POLY AMIDE CURED EPOXY BASED MIO/TIO2 PIGMENTED INTERMEDIATE COAT PAINT (SPEC: AA56112)	AA56112	Dark Brown	50000
4		AA5610014018	EPOXY BASED ZINC RICH PRIMER PAINT(TWO PACK, AS PER SPECIFICATION: AA56114, TO IS14589 GR.II	AA56114	GREY	2000
5		AA5610031206	CHEMICAL RESISTANT EPOXIDE FINISHING PAINT LIGHT GREY (IS:14209) (SPEC: AA56131)	AA56131	LIGHT GREY SHADE NO 631 OF IS 5	5000
6		AA5610005019	CHEMICAL RESISTANT EPOXIDE RED OXIDE ZINC PHOSPHATE PRIMING PAINT (SPEC: AA56105)	AA56105	Red Oxide	5000
7		AA5610031621	Epoxy based Finish paint to IS14209 GREY White SHADE RAL9002,AS PER SPECIFICATION: AA56131	AA56131	GREY White SHADE RAL9002	10000
8		FU5670008995	THINNER FOR EPOXY PAINT (SPEC: AA56708)	AA56708	NA	20000
9	B	AA5610026237	Synthetic Enamel Paint (Long Oil Alkyd) to IS 2932 Smoke Grey Shade No: 692 of IS5	IS 2932/AA56126	Smoke grey to shade no. 692 of IS 5	5000
10		AA5610001013	RED OXIDE ZINC PHOSPHATE (ALKYD BASE)PRIMER TO IS:12744 (latest), AS PER SPECIFICATION: AA56101	AA56101	Red Oxide	30000
11		AA5610026202	SYNTHETIC ENAMEL PAINT (LONG OIL ALKYD) TO IS 2932 LIGHT GREY SHADE No-631 OF IS5	IS 2932	LIGHT GREY	3000
12		AA5610032296	OIL RESISTANT SYNTHETIC ENAMEL PAINT AS PER AA56132 (TO IS 14947-2001 RA 2007), JASMINE YELLOW (397)	AA56132	JASMIN YELLOW	2500
13		FU5670001990	THINNER FOR ALKYL BASED PAINT, AS PER SPEC: AA56701	AA56701	NA	8000
14	C	AA5610034574	HEAT RESISTANT ALUMINUM PAINT TO IS 13183 - GRADE 1 (LATEST)	IS 13183	Metallic Aluminium	25000
15		FU5670098994	THINNER FOR HEAT RESISTANT ALUMINIUM PAINT	In compliance of above Specification IS 13183	NA	5000
16	D	AA5610013011	INORGANIC ETHYL ZINC SILICATE PRIMER TO IS 14946 MAIN COAT (SPEC: AA56113)	AA56113	GREY	50000
17		FU5670097980	THINNER FOR INORGANIC ETHYL SILICATE PRIMER TO IS-14946	In compliance of above Specification IS 14946	NA	5000
18	E	AA5610042208	ALIPHATIC ACRYLIC POLYURETHANE FINISHING PAINT TO IS 13213 LIGHT GREY SHADE NO 631 OF IS 5, (SPEC: AA56142)	AA56142	LIGHT GREY SHADE NO 631 OF IS 5	5000
19		AA5610042593	ALIPHATIC ACRYLIC POLYURETHANE FINISHING PAINT TO IS 13213 SMOKE GREY SHADE NO 692 OF IS 5, (SPEC: AA56142)	AA56142	Smoke grey to shade no. 692 of IS 5	5000
20		AA5610042518	ALIPHATIC ACRYLIC POLYURETHANE FINISHING PAINT TO IS 13213 GREY White SHADE RAL9002, (SPEC: AA56142)	AA56142	GREY White SHADE RAL9002	30000
21		AA5610042607	ALIPHATIC ACRYLIC POLYURETHANE FINISHING PAINT TO IS 13213 Light Blue to (RAL 5012), (SPEC: AA56142)	AA56142	Light Blue to (RAL 5012)	20000
22		AA5610042674	ALIPHATIC ACRYLIC POLYURETHANE FINISHING PAINT TO IS 13213 Golden Yellow to RAL 1004, (SPEC: AA56142)	AA56142	Golden Yellow to RAL 1004	2000
23		AA5610042682	ALIPHATIC ACRYLIC POLYURETHANE FINISHING PAINT TO IS 13213 BLACK to RAL 9011, (SPEC: AA56142)	AA56142	BLACK to (RAL 9011)	2000
24		FU5670098986	THINNER FOR ACRYLIC PAINT	In compliance of above Specification IS 13213	NA	15000
25	F	AA5610007003	Chlorinated rubber based zinc phosphate primer,Colour:Grey,as per BHEL Specification:AA56107	AA56107	Grey	1500
26		FU5670003993	Thinner compatible with Chlorinated rubber based zinc phosphate primer	In compliance of above Specification AA:AA56107	NA	500
TOTAL QTY.						316500

TERMS AND CONDITIONS FOR FRAMEWORK AGREEMENT FOR PROCUREMENT OF PAINTS/PRIMER/THINNER

1) The requirement of Material viz., **Paints, Primer and Thinner etc**. with their respective specifications and quantity is enclosed as **Annexure-A**.
2) Material to be procured from customer approved supplier list (Customer Name: *NTPC/PVUNL for Patratu Project)*

   For others suppliers following will be required.

   i) Registration / Empanelment Requirement: Contract shall be awarded to only such sellers, who are registered / empaneled / approved / enlisted with NTPC/PVUNL for Patratu Project for the required goods category on the date of bid opening. Prospective bidders (if not already registered), are advised to get themselves registered with the said registration authority before bid opening date.

   ii) Seller offer is liable to be rejected if they don't upload any of the certificates/ documents sought in the bid document, tender terms and conditions and corrigendum if any.

3) Offers of bidders for the Items shall be evaluated as per Group wise given in Annexure-A (e.g A, B, C etc), as the paints and thinners are required to produce from same supplier due to compatibility of both with each other.
4) The requirement in tender is for tentative quantity only to enter into rate contract.
5) **Supplier shall supply materials manufactured in their manufacturing facility only.**
6) Supplier to provide Shelf Life Certificate, Test Certificate and Guarantee Certificate along with each lot of supply.
7) Shelf Life of material must be minimum 1 year from date of its manufacturing. Also material of latest manufactured batch not older than 2-3 month should be supplied in a particular lot.
8) Whenever required by BHEL, supplier has to re-validate of the usability of their supplied material after expiry in BHEL stores and shall issue revised shelf life certificates for respective batches of usable material within a specified time frame.
9) Supplier to submit the Test Certificates of respective batches/ lot as per applicable standards or specifications of BHEL.
10) Supplier to guarantee the material minimum for 1 Year from date of its acceptance at BHEL against any manufacturing defect.
11) Packing and marking of material shall be made strictly as per specifications/IS.
12) Material packaging shall be marked with BHEL PO No., Material code, Name and Specification, along with manufacturer brand name, batch no. and manufacturing date. This should also mentioned in respective Test Certificates.
13) Unloading of the materials is in the scope of BHEL. However, demurrages on account of delay in unloading due to improper packing, non-availability of proper dunnage, not adhering to the tender conditions and other reasons attributable to supplier shall be on supplier's accounts only.
14) If any non-conformity is noticed during receipt or use of material at BHEL, the supplier has to take corrective and preventive actions accordingly within a specified time frame and shall also arrange for replacement of that lot at his risk and cost whenever required.

SURFACE PREPARATION AND PRETREATMENT OF FERROUS SURFACE PRIOR TO PAINTING

1 GENERAL

This standard, details the surface preparation and pre-treatment of ferrous surfaces prior to painting. This includes removal of oil, grease, dirt and swarf followed by removal of rust by means of mechanical or chemical treatment.

Assistance has been taken from IS 8629, Part 2–1977 and Swedish Standard SIS 05 5900–1967 in preparing this standard.

2 REMOVAL OF OIL, GREASE, DIRT AND SWARF

Before application of paint, it is very essential to have a very clean surface. All oil, grease, dirt and swarf to be removed by means of solvent, alkali, emulsion or steam cleaning. Refer to specific MSDS (Material Safety Data Sheet) for precautions to be taken during storage, handling and disposal of such chemicals used.

2.1 Solvent cleaning

This shall be done by using petroleum solvent (other than CTC) or trichloroethylene.

2.1.1 Petroleum solvent cleaning

The method involves use of petroleum solvents like white spirit to BHEL specification AA56701. The process of cleaning such as immersion or brushing is decided depending on the size/shape of the component. However, sufficient time should be allowed for removal of the contaminants and in no case for less than one minute. Cleaning with brushing or wiping is used for the "insitu" cleaning of articles too large for immersion tanks or spray cleaning surfaces. The surface of the fabricated panel shall be cleaned with brush or cloth soaked in white spirit to BHEL specification AA56701 to remove stains of oil, grease etc. before rust removal. The solvent should be allowed to evaporate before next operation. If required, clean cotton cloth can be used for wiping the surface. The cloth shall be changed every time or the contaminants on the cloth will adhere to the substrate.

a) Process

Two main methods are given below. Details depend upon the quantity and characteristics of the parts or assemblies to be cleaned.

i) Immersion

This method may be used for unit parts or assemblies when contamination is light and when the highest degree of cleanliness is not essential; it is particularly suitable for hand cleaning in small tanks. The articles should be immersed in the solvent long enough to allow removal of the contaminants, and in no case for less than one minute. Agitation is desirable, and brushing or scrubbing with wire brushes will aid quick cleaning.

ii) Brushing or wiping

This method is intended for the removal of oil, grease and light contamination from bare metal areas or assemblies containing painted surfaces or non-metallic inserts that might be damaged by general application of solvent. It may also be used for the 'in-situ' cleaning of articles too large for immersion tanks or spray cleaning systems.

b) Handling precautions

Articles should be placed on hooks or racks or in suitable containers that permit adequate draining. They should not be handled with bare hands after cleaning. Clean gloves or similar protection should be used and handling kept to a minimum.

c) Safety precautions

Petroleum solvents should be used at room temperature in a well ventilated area and suitable exhausts and fire extinguishers should be provided, as these solvents are flammable. Oil-resisting synthetic rubber gloves should be worn when handling articles during cleaning, to protect the articles from sweat residues and to avoid any possible effect of the solvent on the skin. Care should be taken to avoid breathing the petroleum solvent vapour. Aprons, respirators and safety glasses shall be used by the operators who are responsible for the above operations.

d) Limitations

Petroleum solvent cleaning suffers from the following drawbacks:

i) Fire risk

ii) Brush or wipe or immersion methods being manual in operation are slow and time consuming and therefore unsuitable on their own for continuous production lines, and

iii) The degree of cleanliness achieved by such methods is not high and they are generally used for preliminary cleaning to supplement a proper degreasing operation.

2.1.2 Trichloroethylene cleaning

The method relates to surface cleaning with trichloroethylene solvent. This can be done by placing the equipment in the vapours of trichloroethylene or by immersing it in boiling trichloroethylene or by jetting trichloroethylene at high pressure on surfaces to be cleaned.

a) Degreasing

The three main processes are described below

The precise details of the equipment and the method of operation for each process depends on the quantity and characteristics of the parts or assemblies to be cleaned; the plant manufacturers' recommendations should be followed.

i) Vapour process

The remove simple films of oil and grease, articles may be subjected to the vapour process, in which the parts are exposed in a bath of solvent vapour. The vapour condenses on the cold surface of the articles and the condensate dissolves the oil and grease, taking it away to the base of the tank. To ensure the maximum condensation, the temperature of the articles should be as near to the room temperature as possible at the time of immersion. They should be passed through or suspended in the solvent vapour until no further condensation occurs, after which no further degreasing will take place. Articles with a very heavy film of grease may need a second exposure after cooling.

ii) Liquid process

Loosely bound contamination (too much for vapour treatment) such as polishing compound, swarf and road dirt may be removed by immersing the parts in vigorously boiling trichloroethylene.

iii) Jetting process

Articles with obstinate dirt deposits that cannot be removed by boiling trichloroethylene may require jetting at high pressure with the hot solvent. The jetting should be carried out only in equipment, specially designed for the purpose.

b) Handling precautions

During processing, the articles should be placed on hooks or racks or in a suitable container. They should be so arranged that there is adequate opportunity for the solvent to drain from holes, crevices, pockets and other irregularities. Parts or assemblies that would trap solvent should be rotated or tilted during the degreasing process to prevent drag-out of trichloroethylene. Handling may be reduced by

using mechanical and conveyor type degreasing plants which automatically rotate or tilt the articles. After cleaning, articles should not be handled with bare hands. Clean gloves or similar protection should be used.

c) Safety precautions

Trichloroethylene is a toxic substance. All safety precautions like wearing aprons, rubber gloves, respirators and safety glasses shall be used by the operator responsible for the above operations. Care should be taken to avoid breathing the vapour near degreasing equipment.

2.2 ALKALINE CLEANING

Cleaning of surface can be done by using alkaline degreasing agents, which are very good for cleaning but by and large injurious to skin. This process can be followed either by immersion in hot alkaline mixture or by electro cleaning process or by using jet cleaning process. In the electro cleaning process tank to be used as one electrode while job to the cleaned to other electrode. In the jet cleaning process, job to be cleaned is subjected to jet of hot alkaline solution at high pressure. Details of safety and handling as per IS 8629 Part 2.

2.3 EMULSION CLEANING

These are diphase cleaners of oil/water emulsion type. These cleaners may be applied by spray or dip, though spray is more common. Details of safety and handling as per IS 8629 Part 2.

2.4 STEAM CLEANING

This method related to the use of a jet of high pressure steam for the “in-situ" cleaning of large unit parts, assemblies and machinery that cannot be accommodated in a cleaning apparatus. The cleaning may be carried out with pure steam or with alkaline solution/steam mixture. Details of safety and handling as per IS 8629, Part 2.

3 REMOVAL OF RUST AND SCALE BY MECHANICAL OPERATIONS

3.1 HEAVY LOCALISED RUST

If rusting has occurred locally, but to such an extent that some pitting with hard rust flakes, is exhibited, the rust shall be first removed by using hand scraping or scraping with mechanical power tools or flame cleaning. The affected surface shall be treated as that mentioned for "Light Rust” in Clause 4.1.

3.1.1 Hand scraping

Scraping with a hand scraper generally follows by steel wire brushing and finally sanding the surface with a coarse sand paper, steel wool or emery paper.

3.1.2 Scraping with mechanical power tools

This gives better and quicker results than above, but it may not be possible to remove firmly adhering mill scale even with this method.

3.1.3 Flame cleaning

This is done by heating the surface with oxy-acetylene torch. Because of the difference in expansion between the heated mill scale and the bulk of the steel, the scale becomes loose and either falls off or is easily removed with wire brush. This process is not suitable for plates less than 6 mm thick because of buckling problem that may result during this process.

3.2 GENERAL RUSTING

If the surface is widely rusted to such as extent that pitting with hard flakes is exhibited, generally the job shall be grit or shot blasted. The principle is to impinge under pressure of air, a jet of sharp granulated steel (steel or non-metallic grit) on to the metal surface removing in the process any rust and scale, including firmly adhering mill scale. A steel surface properly cleaned by blasting may be immediately recognised by its silver grey surface and the criterion for good shot blasting is the evenness of the colour of the surface so cleaned. Precautions shall be taken when shot blasting light gauge steel to see that buckling does not occur as a result of continuous impingement of grit or steel shot under high velocity.

Before the process of blast, cleaning is carried out, may be cleaned by emulsion/steam cleaning to remove dirt, dust, grease etc.

3.3 BLAST CLEANING

The process of surface preparation by Blast Cleaning is described below:

3.3.1 White metal blast cleaning

A white metal blast cleaned surface when viewed without magnification shall be free of all visible oil, grease, dirt, dust, mill scale rust, paint oxides, corrosion products and other foreign materials.

3.3.2 Commercial blast cleaning

A commercial blast cleaned surface when viewed without magnification shall be free of all visible oil, grease, dirt, dust, mill scale rust, paint oxides, corrosion products and other foreign materials.

Staining shall be limited to no more than the 33% of each square inch of surface area and may consist of light shadows, slight streaks or minor discolouration caused by stains of rust. Stains of mill scale or stains of previously applied paint, slight residues of rust and paint may also be left in the bottom of the pits if the original surface is pitted.

3.3.3 Brush-off blast cleaning

A brush-off blast cleaned surface when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scales, loose rust and loose paint.

The entire surface shall be subjected to the abrasive blast. The remaining mill scale, rust or paint shall be tight.

When painting is specified, the surface shall be roughened to a degree suitable for the specified paint system.

Immediately prior to paint application, the surface shall comply with the degree of cleaning as specified.

3.3.4 Near white blast cleaning

A near white blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products and other foreign matter, except for staining as noted below:

Staining shall be limited to no more than 5% of each square inch of surface area and may consist of light shadows, slight streaks or minor discolouration caused by stains of rust, stains of mill scale or stains of previously applied paint.

3.4 SURFACE PREPARATION BEFORE BLAST CLEANING

Before blast cleaning, visible deposits of oil or grease shall be removed by solvent cleaning.

Before blast cleaning the surface, imperfections shall be removed from the surface as specified below:

Weld spatter shall be removed by using chipping hammer, spud bar, scrapper or by grinding.

Areas of unacceptable porosity should be filled or closed over with a needle gun or peening hammer.

Sharp edges may be removed by grinding, mechanical sanding, filling etc.

Deep corrosion pits, gouges, clamp marks or other surface discontinuities may be repaired by grinding or filling.

Areas of poor design for corrosion protection such as tack or spot welded connections, back to back angles, crevices (narrow openings) may require corrections by structural or design modifications where this is not possible, particular consideration should be devoted to minimise the effect of such deficiencies.

Substrate Chemical contamination (for blasting): shall be conducted with any suitable method to identify salt contamination.

– Type of check : Measurement
– Quantam of check : One Test/abrasive lot used
– Acceptance Norm : Chloride < 15 µg/cm² (ppm), Sulphate < 20 ppm

3.5 BLAST CLEANING METHOD AND OPERATION

3.5.1 Clean, dry compressed air shall be used for nozzle blasting (moisture separators, oil separators, traps or other equipment may be necessary to achieve this requirement).

3.5.2 The various method of surface preparation to achieve a blast cleaned surface are as follows:

a) Dry abrasive blasting using compressed air, blast nozzles and abrasive.

b) Dry abrasive blasting using a closed cycle, recirculating abrasive system with compressed air, blast nozzles and abrasives with or without vacuum for dust and abrasive recovery.

c) Dry abrasive blasting using a closed cycle recirculating abrasive system with centrifugal wheels and abrasive.

3.6 PROFILE OF ROUGHNESS OBTAINED DURING BLASTING

This will depend upon the abrasive used, the air pressure and the technique of blasting. Too low a profile may not provide a sufficient key for a coating while too high a profile may result in uneven coverage of high sharp peaks leading to premature coating failure, particularly for thin coatings such as blast primers apart from higher paint consumption.

The following table gives a brief guide to typical roughness profiles obtained using various types of abrasives

Types of abrasive	Mesh size	Maximum height of profile
Very fine sand	80	37 microns
Coarse sand	12	70 microns
Iron shot S 390 Typical non metallic "Copper slag"	14	90 microns
1.5 to 2 mm grain size	--	75/100 microns
Iron grit no. G16	12	200 microns

Profile measurement shall be made using appropriate profile gauge supplied with calibration standards.

3.7 ABRASIVE SELECTION

The selection of the size and type of abrasives which will most effectively and economically produced the desired surface finish, shall be as per Section-5 of "Surface preparation commentary (SSPC-SP-COM)", encl.no.25.

In general, select the smallest size abrasive that will produce the desired cleaning results. Usually, this will give the fastest, most economical cleaning operation.

3.8 SURFACE PREPARATION AFTER BLAST CLEANING AND IMMEDIATELY PRIOR TO PAINTING

Visible deposits of oil, grease or other contaminants shall be removed by solvent cleaning.

Dust and loose residues shall be removed from prepared surfaces by brushing, blowing off with clean, dry air, or vacuum cleaning.

After blast cleaning, surface imperfection which remain shall be removed to the extent required as explained at 4.2.

Any visible rust that forms on the surface of the surface steel after blast cleaning shall be removed by re-blasting the rusted areas.

3.9 INSPECTION

All work and material supplied under this specification shall be subject to timely inspection by Q.C.

Conditions not complying with this specifications shall be corrected.

The engineering and process documents, sub-contract, scope-procurement documents should establish responsibility for inspection and for any required affidavit certifying full compliance with this specifications.

The appearance of the surface after cleaning should correspond to pictorial standard as mentioned below

	Blast cleaning method	Pictorial standard	For Pictorials
1	White metal blast cleaning (blast cleaning to visually clean steel)	A Sa 3, B Sa 3 C Sa 3 & D Sa 3	Annexure 1a
2	Commercial blast cleaning (light blast cleaning)	B Sa 1, C Sa 1 & D Sa1	Annexure 1b
3	Brush-off blast cleaning (through blast cleaning)	B Sa 2, C Sa 2 & D Sa2	Annexure 1c
4	Near white blast cleaning (very through blast cleaning)	A Sa 2 ½, B Sa 2 ½, C Sa 2 ½ & D Sa 2 ½	Annexure 1d

Alternatively, NACE Visual Comparators may also be used for inspection purposes.

The test for assessment of dust on steel surfaces prepared for painting can be carried out as per the Pressure-sensitive Tape method as per ISO 8502-3.

NOTE:

1) All jobs are generally to be shot/grit blasted.
2) For pictorial standard only coloured profile should be used. (xerox copy not to be referred)
3) Blast cleaning surface should be measured after cleaning.

4 REMOVAL OF RUST BY CHEMICAL CLEANING

4.1 Light Rust

If a thin film of very light rust exists on the work, it shall be removed by means of de-rusting solution /rust converter. After degreasing as above, the de-rusting solution shall be applied in a thin film, using brush or swab and left for 10 to 15 minutes. At the end of the period and before it has dried, it shall be wiped off with a clean dry cloth and the surface examined any red rust is still visible, further similar application shall be made until the surface exhibits a grey colour only.

The surface shall then be followed to dry and be brushed down with a clean dry brush before painting. The drying may be accelerated by swabbing or brushing the surface with Industrial Methylated Spirit (AA56705). This is recommended for faster drying and removal of un-reacted acid.

NOTE:

In case of Epoxy painting system like BHEL standard AA0674104 and AA0674111 shot blasting of surface shall conform to Sa 2 ½ minimum of Swedish Pictorial Standard SIS 055900.

4.2 SULPHURIC ACID, HYDROCHLORIC ACID OR PHOSPHORIC ACID PICKLING

To remove scale and rust, pickling can be done by using sulphuric acid 5 to 20% concentration by volume at 60 to 80°C or hydrochloric acid 20 to 50% concentration by volume at room temperature or phosphoric acid at 5 to 25% concentration by vol. At 60 to 85°C.Appropriate inhibitors shall be used in the pickling bath to reduce acid attach on the base metal. This shall be followed by washing in water followed by dipping in phosphoric acid solution, 1-2% concentration by volume.

NOTE:

The pickling acid selection should be made on the basis of the material pickled.

4.2.1 Process details

The components to be treated shall be immersed in the tanks made of steel with suitable lining with chemicals, temperature and dipping time as given below:

(Suitable chemicals as per applicable purchase specification from time to time shall be used according to the process)

Concentration process	Pointage (Chemical in water) see note below	Bath dipping see note below	Temp. (deg. C)	Time
Degreasing (if hot)	3-5% WT/VOL	27 - 45	80 - 90	10-15 minutes
Degreasing (if cold)	10-15% WT/VOL	80 - 90	Room temp.	10-15 minutes
Rinsing in cold running water tank with over flow arrangement				
De-rusting (cold)	20-40% VOL/VOL	20 - 40	Room temp.	10-20 minutes
Rinsing in cold running water tank with over flow arrangement				
Phosphating (cold)	5-6% VOL/VOL	25 - 30	Room temp.	20-30 minutes
Rinsing in cold running water tank with over flow arrangement				
Passivation (if hot)	0.1-0.2% VOL/VOL	Free acid: 0.1-0.2ml per 25ml; Total acid: 2.5ml max. per 25ml	50 - 60	30-45 seconds
Passivation (if cold)	Same as above	Same as above	Room temp.	2-3 minutes

NOTE

a) The values are indicative. The chemical concentration, temperature (hot or cold), dipping time are to be maintained as given by the manufacturer of the chemical and the nature of oil/soil/rust on the component.

b) Pointage: is the value of the titrate (chemical used for titration)

Of a given strength, when a sample (whose concentration is to be checked) of 10ml is taken for titration (for convenience of titration, add 100ml water, value will not be different if water is added or not). For example, when a 10ml of degreasing solution is titrated using 0.1 N hydrochloric acid, if the titrate value is 25ml, then the pointage of degreasing solution is 25.

4.2.2 Analysis of pre-treatment baths

a) Take 10ml of sample solution + 100ml water + 6 to 8 drops of indicator given. Pour into a 250ml conical flask and shake well.

b) Titrate against the chemical given and observe for the change in colour. Note the value of titrate used. That is the pointage, which shall be as per the process details given earlier.

Solution	Indicator	Titrate with	Turning point
Degreasing	Phenolpthalin	0.1 N Hydrochloric acid	Pink to clear
De-rusting	Methyl orange	1.0 N Sodium hydroxide	Orange to yellow
Phosphating	Phenolpthalin	0.1 N Sodium hydroxide	Colourless/slight yellowish to pink atleast for 10 seconds

Passivation - given in further pages

NOTE

Toner concentration checking: Dip starch iodide paper for one minute in solution, observe the change in colour.

Colour change	Inference
Remains white	Toner insufficient
Turns blue	Toner sufficient
Turns dark blue	Toner excess

Passivation solution Titration Analysis:

For free acid strength:

Take 25ml sample in a measuring flask and pour into 100ml conical flask. Add 6 to 8 drops of Bromocresol green solution. See the colour remains yellow, titrate using 0.1 N sodium hydroxide until colour changes to green or blue. Note the value of standard solution.

For total acid strength:

Continue titration adding phenolphalin indicator to 0.1 N sodium hydroxide until solution changes to purple. Note the volume of sodium hydroxide.

4.3 ELECTRO - CHEMICAL CLEANING

It is possible to remove rust and scale by cathodic treatment in acid solution, cathodic treatment in alkaline solution, anodic treatment or alkaline de-rusting process as per IS 6005.

NOTE

Within 8 hours of surface preparation, the job should be subjected to phosphating or application of priming paint.

Surface cleaning and painting should not be carried out when the humidity in the chamber is above 80% (RH).

5 INSPECTION FOR PROCESS CONTROL

Quality control inspector shall visually inspect the prepared surface for freedom from rust, stain, oil or grease before application of priming paint. The records of surface cleanliness (extent of cleaning and profile) shall also be inspected. It shall also be ensured that the shot blasted surface should be subjected to phosphating or application of priming paint within 4 hours except the jobs which need pressure testing due to code requirements.

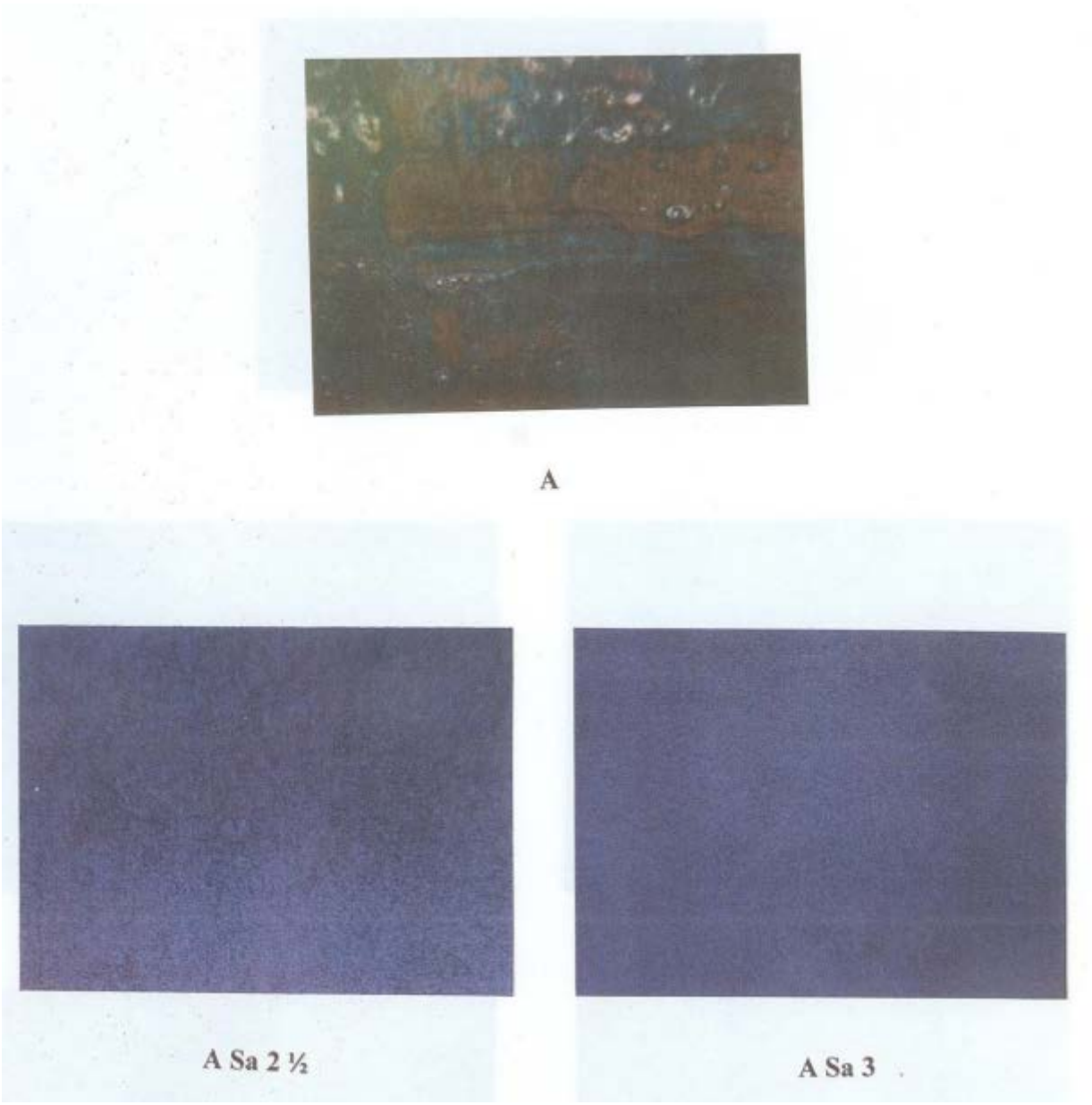
A comparative table showing the various equivalent standards is presented in the ANNEXURE 2.

6 REFERRED STANDARDS (Latest Publications Including Amendments)

1) AA56701
2) AA56705
3) AA0674104
4) AA0674111
5) IS 6005
6) IS 8629 Part 2
7) ISO 8502
8) Swedish standard SIS: 05 5900-1967

Annexure-1a
(Clause 3.9)

SURFACE FINISH RUST GRADE



A

A Sa 2 ½

A Sa 3

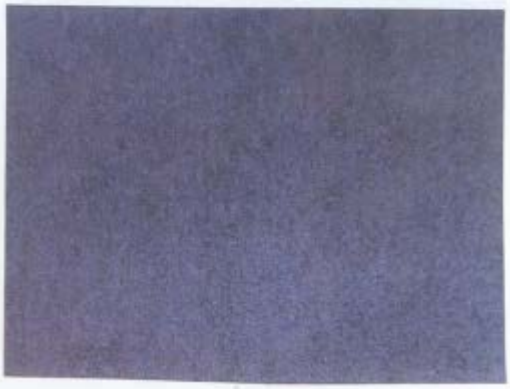
Annexure-1b
(Clause 3.9)

SURFACE FINISH RUST GRADE

B

B Sa 1

B Sa 2

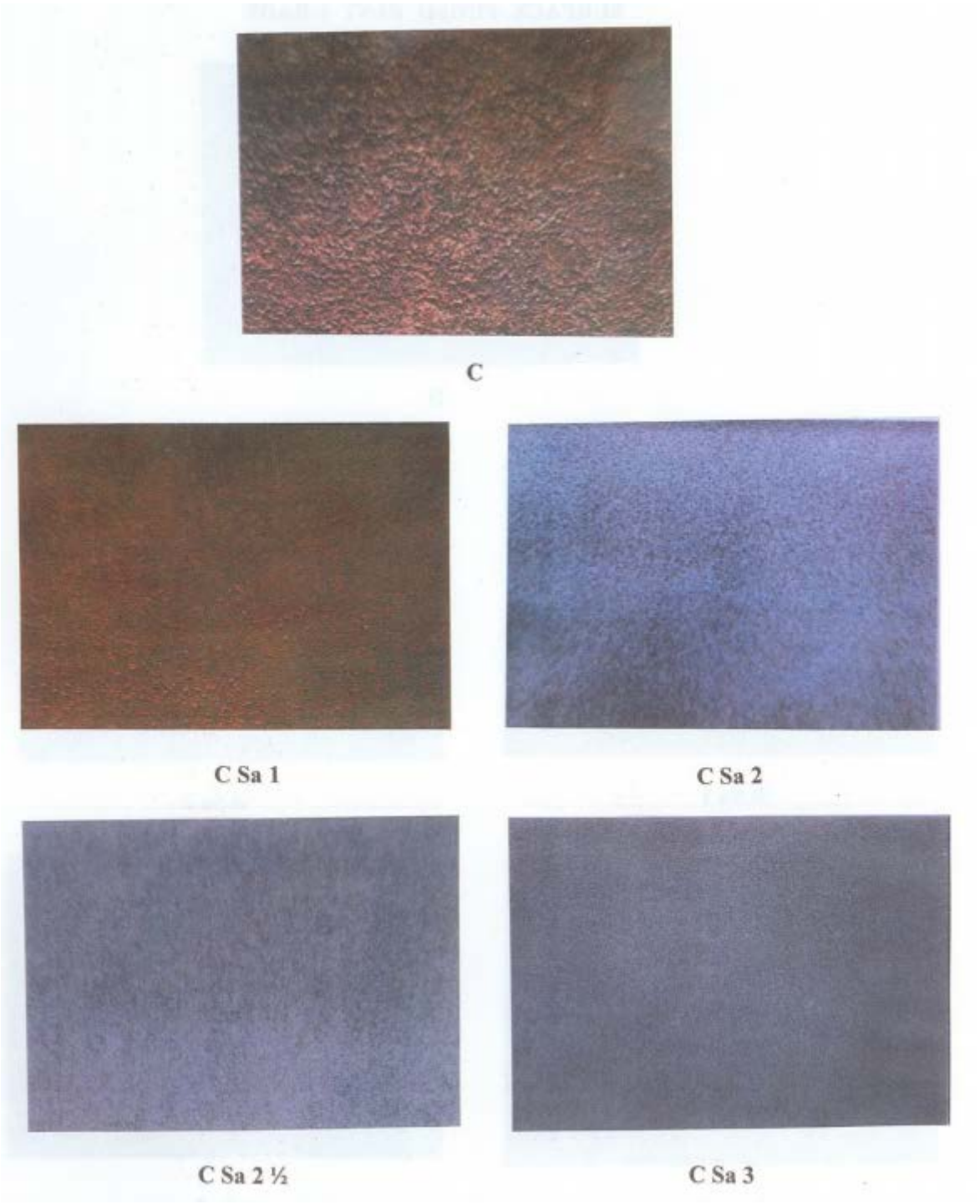


B Sa 2 ½

B Sa 3

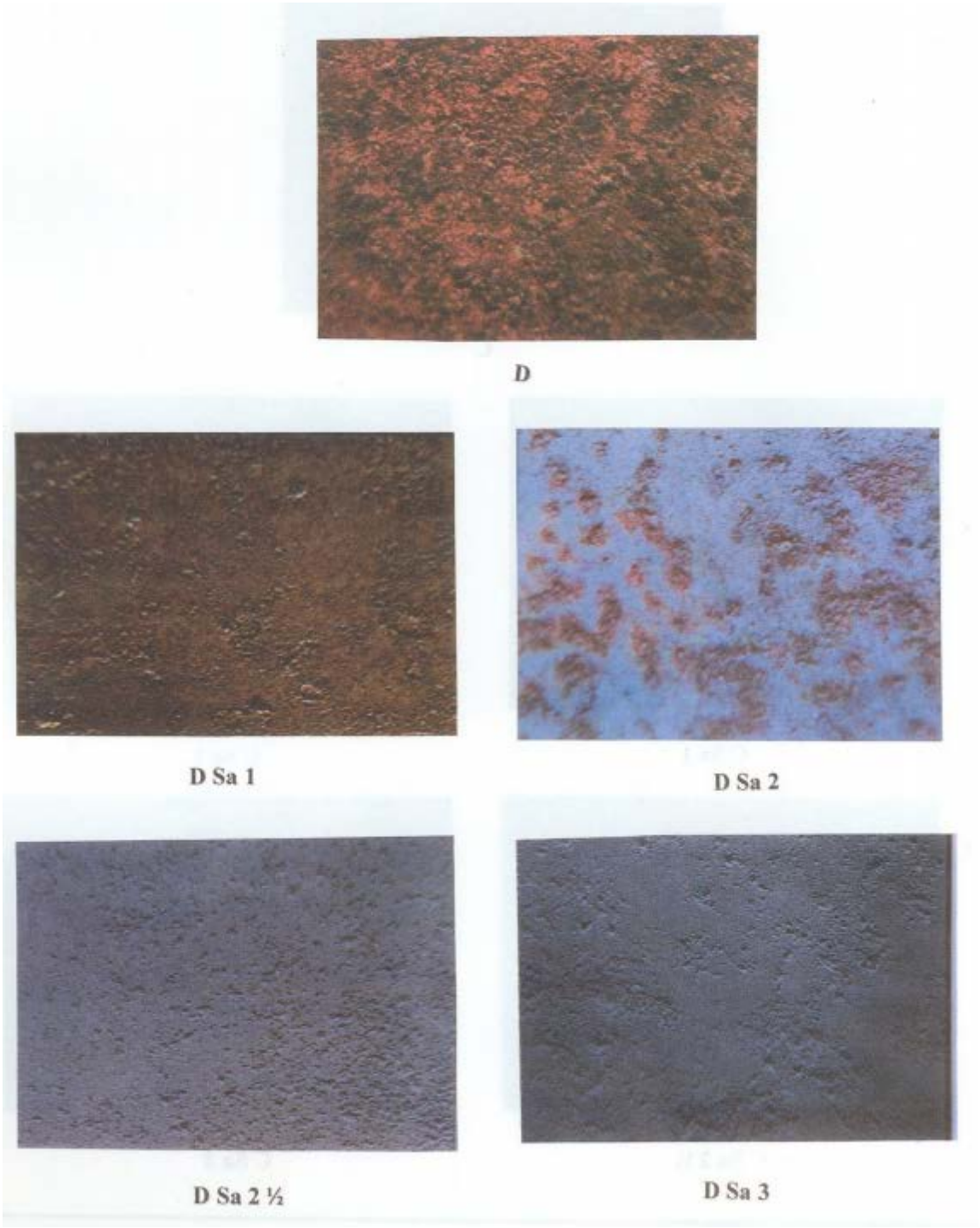
Annexure-1c
(Clause 3.9)

SURFACE FINISH RUST GRADE



Annexure-1d
(Clause 3.9)

SURFACE FINISH RUST GRADE



D

D Sa 1

D Sa 2

D Sa 2 ½

D Sa 3

Annexure-2
(Clause 5)

INTERNATIONAL STANDARDS FOR SURFACE PREPARATION – A COMPILATION OF NEAREST EQUIVALENTS

Sl No.	Surface preparation	Swedish standard SIS: 055900	German standard DIN: 55928 Part-4	SSPC standard	BS 4232	A.S. 1627 Part-4	BSI standard IS:477	NACE standard
1	Blasting cleaning to white metal	Sa 3	Sa 3	SSPC-SP 5	1st Quality	Class 3	Class A1.1	1
2	Blast cleaning to near white metal	Sa 2½	Sa 2½	SSPC-SP10	2nd Quality	Class 2½	Class A1.2	2
3	Blast cleaning to commercial quality	Sa 2	Sa 2	SSPC-SP 6	3rd Quality	Class 2	Class A1.3	3
4	Brush-off blast cleaning	Sa 1	Sa 1	SSPC-SP 7	--	Class 1	Class A 1.4	4
5	Power tool cleaning	St 3	St 3	SSPC-SP 3	--	AS 1627 Part 2	Class 6.2.1.2	--
6	Hand tool cleaning	St 2	St 2	SSPC-SP 2	--	AS 1627 Part 7	Class 6.2.1.2	--

NOTES FOR ABOVE Sl. Nos. :

1) Removal of all visible rust, mill scale, paint and other contaminants.
2) 95% of any section of surface area is free from all rust, mill scales and other visible residues.
3) Two-thirds of any section of the surface area is free from all rust, mill scales, etc.
4) Removal of all loose mill scales, rust and foreign matter.
5) Through scraping and wire brushing to remove loose mill scales, rust and foreign matter using power operated tools.
6) Removal of loose rust and soil by wire brushing without using power tools.

MEASUREMENT OF DRY PAINT THICKNESS, ADHESION GLOSS, AND FINISH OF PAINTED SURFACE

1.0 SCOPE:

This standard covers the details and guidelines for measurement of dry film thickness adhesion, gloss and finish of painted surfaces in laboratory and field.

1.1 THICKNESS MEASUREMENT:

General: This method describes the procedures to measure the thickness of a dry film of a non-magnetic coating applied on a magnetic substrate using commercially available magnetic gages. These procedures are intended to supplement manufactures' instructions for the manual operation of the gages. The types of gages covered are non destructive to the film being measured.

Gage types: Magnetic gages of two types may be used:

Type 1 - Pull-off Gages (such as Mikrotest, inspector, and Tinsley Thickness Gages and the Elcometer Pull-off Gage) and

Type 2 - Fixed Probe Gages (such as Elcometer Thickness Gage, Minitector, General Electric Type B thickness gage, Verimeter, perfascope, and Dermitron).

1.2 ADHESION: (ISO: 2409 - (E)) - 1992:

General:
This standard describes a test method for resistance of paints coatings to separation from substrates when a right-angle lattice pattern is cut into the coating, penetrating through the substrate. The property measured by this empirical test procedure depends, among other factors, on the adhesion of the coating to either the preceding coat or the substrate.

The method described may be applied either as a pass/fail test or where circumstances are appropriate as a six-step classification test when applied to a multi-coat system, assessment of the resistance to separation of individual layers of the coating from each other and from substrate.

1.3 GLOSS (IS: 101 PART 4 / SECTION 4) - 1988:

General:
This standard describes two methods for measurement of specular gloss of paint films with 20º , 45º, 60º and 85º geometry. The methods are not suitable for measurement of the gloss of metallic paints. Two procedures are specified, the first being for assessment of a film prepared from a liquid film and the second for assessment of an existing painted surface. Depending upon gloss level optical angle may be selected as follows:

a) The 60° geometry method is applicable to all paint films but, for very high-gloss paints or those of near-matt sheen, the 20°or the 85°geometry method may be more suitable.

b) The 20° geometry method is intended for obtaining improved differentiation of high-gloss paints, that is those with a 60° gloss higher than 70 units.

This does not mean, however, that the 60°geometry method cannot be used for paints having a 60° gloss higher than 70 units.

c) The 45° or 85° geometry method is intended for obtaining improved differentiation of low - gloss paints, that is those with a 60° gloss lower than 30 units.

This does not mean, however, that the 60° geometry method cannot be used for paints having a 60°gloss lower than 30 units.

1.4 FINISH (IS: 101 (PART 3 / SECTION 4) - 1987:

This standard describes the details for determination of finish of paint and varnish films.

2.0 PROCEDURE OF CALIBRATION AND THICKNESS MEASUREMENT:

2.1 The thickness measuring gages available commercially have to be calibrated before use. The procedures of calibration and measurement are described below:

(a) **Access to bare substrate:** To determine the effect of the substrate condition on the gage readings, access is required to some unpainted areas. Small representative areas may be masked off during the painting. If the paint has already been applied to the entire surface, small areas of paint may be removed and later patched. An alternative procedure that may be specified is to provide separate unpainted reference panels of similar steel and surface condition. These would be used as the bare substrate in procedures mentioned below.

(b) Repeated gage readings, even at points close together, may differ considerably due to small surface irregularities. Therefore, three (3) gage readings shall be made for each spot measurement of either the substrate or the paint. Move the probe to a distance of one to three inches (two to eight centimeters) for each new gage reading. Discard any unusually high or low gage reading that cannot be repeated consistently. Take the average of the three gage readings as the spot measurement.

2.1.1 CALIBRATION MEASUREMENTS - TYPE 1 PULL-OFF GAGES:

(a) For Type 1 gages, the preferred calibration standards are small, chrome plated steel panels that are available from the National Bureau of Standards in coating thickness from 0.5 to 80 mils (12.7 to 2032 microns) or more. The plated panels are flat smooth steel 1.125 x 1.125 inches (2.85 x 2.85cm) in size. They exceed the critical mass of steel needed to satisfy the magnetic field of the Type 1 (pull-off) magnets. Shims of plastic or of non-magnetic metals which are acceptable for calibration of Type 2 (fixed probe) gages should not be used for calibration of the Type 1 gages.

(b) Using the Type 1 (pull-off) gage, measure the thickness of a series of calibration standards covering the expected range of paint thickness. Record the calibration correction either + or - required at each standard thickness. To guard against gage drift during use, recheck the gage at least once during each work shift with one or more of the standards. In case of dispute the buyer and seller should agree on the details and frequency of calibration.

(c) When the gage adjustment has drifted so far that large corrections are needed, it is advisable to readjust closer to the standard values and recalibrate. When the gage can no longer be adjusted into reasonable agreement with the reference standards, have it rebuilt or replaced.

(d) Measure (A), the bare substrate, at a number of spots to obtain a representative average value.
Note: The gage is not to be calibrated on the bare substrate.
(e) Measure (B), the dry paint film, at the number of spots as specified in Cl. No. 2.1(b).
(f) Subtract the readings (B - A) to obtain the thickness of the paint film.

NOTE: When an uncalibrated gage is used, it is necessary to correct the A and B readings using the corrections as determined from Cl.No.2.1 (b).

2.1.2 CALIBRATION AND MEASUREMENT - TYPE 2, FIXED PROBE GAGES:

For Type 2 (fixed probe) gages, shims of plastic or of non-magnetic metals laid on the appropriately cleaned steel base, at least 3 x 3 x 0.125 inches (7.6 x 7.6 x 0.32cm) are suitable working standards. During calibration, hold the gage firmly enough to press the shim tightly against the steel surface. Avoid excessive pressure that might indent the plastic or, on a blast cleaned surface, might impress the steel peaks into the under surface of the plastic. A very smooth plate of mild steel free of mill scale and rust is suitable for the zero thickness standard. Because of the stronger magnetic field of the Type 2 (fixed probe) gages, the small, National Bureau of Standards calibration standards, acceptable for Type 1 (pull-off) gages, shall not be used with Type 2 gages.

It is IMPORTANT to confirm the gage setting by measuring the shim at several other areas of the bare substrate. Readjust the gage as needed to obtain an average setting representative of the substrate.

Spot measurement of paint: With the gage adjusted as above, measure the dry paint film as specified in Cl.2.1.3. The gage readings indicate the paint film thickness.

Recheck the gage setting at frequent intervals or as agreed during a long series of measurement.

2.1.3 NUMBER OF MEASUREMENTS FOR CONFORMANCE TO A THICKNESS SPECIFICATION:

Number of measurements and minimum thickness: Make five (5) separate spot measurements (average of three readings, see Cl. 2.1 (b)) spaced evenly over each 100 square feet (9.3 square meters) of areas to be measured. The average of five spot measurements for each such 130 square feet area shall not be less than the specified thickness. No single spot measurement in any 100 square feet area shall be less than 80% of the specified thickness.

(a) For structures not exceeding 300 square feet in area, each 100 square feet area shall be measured.

(b) For structures not exceeding 1,000 square feet in area, three 100 square feet areas shall be randomly selected and measured.

(c) For structures exceeding 1,000 square feet in area, the first 1,000 square feet shall be measured as stated in (b) and for each additional 1,000 square feet of area or increment thereof, one 100 square feet area shall be randomly selected and measured.

If the dry film thickness for any 100 square feet area (b and c) is not in compliance with the requirements, then each 100 square feet area shall be measured.

Other size areas or number of spot measurements may be specified in the product documents as appropriate for the size and shape of the structure to be measured.

2.1.4 THICKNESS LIMITS: Some paints are especially sensitive to high or low film thickness. In all cases, limitations on maximum or minimum film thickness specified in the manufacture's instructions shall be followed.

2.1.5 ACCURACY:

Gage accuracy: All of the above magnetic gages, if properly adjusted and in good condition, are inherently accurate to within ±15% (most gages with ±10%). It should be noted that this is only the accuracy built into the gages themselves.

Items which affect gage accuracy:
Much larger, external errors may be caused by variations in method of use of gages or by unevenness of the surface of the substrate or of the coatings. Also, any other films present on the steel (rust or mill scale or even a blast cleaned profile zone) will add to the apparent thickness of the applied paint film. Thus, for accurate use of the magnetic gages, some knowledge is required of the nature of the surface being painted and of its effect on the gage readings. For this purpose, the gage operator must have access to atleast small areas of the unpainted substrate as in Cl. 2.1. As a minimum, he must know whether he is measuring only paint, or paint plus mill scale, or paint plus steel surface roughness.

2.1.6 PRINCIPLES OF THE MAGNETIC GAGE:

Each of these gages can sense and indicate only the distance between the magnetic surface of the steel and the small rounded tip of the magnet that rests on the top surface of the paint. This measured distance, from the top surface of the paint, must be corrected for the thickness of any extraneous films or other interfering conditions on the surface of the steel. Such correction is made, as described in Cl. 2.1.1 and 2.1.2. It might be noted that many disagreements in thickness reports arise from different conceptions of this correction, or of just what is measured by the gages under various conditions and methods of use.

Type 1 (pull-off) gages use a type of spring balance to pull a small permanent magnet from the surface of the painted steel. The magnetic force holding to the surface varies inversely as a non-linear function of the distance between magnet and steel i.e., the thickness of the dry paint film (plus any other films present).

Normally, Type 1 gages are not adjusted or reset for each new series of measurements. In fact, adjustment is not advisable unless the gage is to be very carefully calibrated with National Bureau of Standards calibration standards as indicated in Cl. 2.1.1. In normal use the gage may not require adjustment for months.

Shims of sheet plastic or of non-magnetic metals which are permissible for calibrating Type 2, fixed probe gages, should not be used for calibration of Type 1 gages. Such shims are usually fairly rigid and curved and do not lie perfectly flat even on a smooth steel test surface. Near the pull-off point of the calibration measurements with any Type 1 gage, the shim frequently springs back from the steel surface, raising the magnet too soon and causing erroneous calibration readings.

Type 2 (fixed probe) gages depend on changes in magnetic flux within the probe or the instrument. The magnitudes of these changes also are an inverse (nonlinear) function of the distance between the probe and the steel surface under the paint. The probes of these gages remain in contact with the paint during the measurement. Type 2 gages differ also in that they are usually adjusted to a selected film thickness value before each new series of measurements.

Type 2 gages should be checked periodically for sensitivity. Using a smooth steel base at least 0.125 inches thick (0.32cm) and free of mill scale, set the gage with a shim in the thickness range most used. Measure several other shims, thicker and thinner than the setting. The gage should respond fully to the difference in thickness of the shims.

REPEATABILITY: These magnetic gages are necessarily sensitive to very small irregularities of the paint surface or of the steel surface directly below the small rounded tip of the magnet. The gage readings are also influenced by the steadiness of the operator's hand. Thus, repeated gage readings on a rough surface, even at points very close together, frequently differ considerably. However, repeated gage readings within 0.2 mils (0.5 microns) have been reported for average readings taken in a limited area and on a variety of surfaces.

ZERO SETTING: It is sometimes suggested that the magnetic gages be adjusted or set at the scale zero (0), with the gage applied to a very smooth uncoated steel panel. However, the zero point on most of the gage scales appears to be least accurately positioned. Therefore, the scale should be set to indicate most accurately in the range of thicknesses that are to be measured. It would be still worse to "zero" the gage on a rough bare steel surface. This would misplace the nonlinear scale considerably.

ROUGHNESS OF THE STEEL SURFACE: If the steel surface is smooth and even, its surface plane is the effective magnetic surface, and the distance indicated by the gage is truly by the paint thickness. However, if the steel is roughened, as by a blast cleaning, the "apparent" or effective magnetic surface that the gage senses is an imaginary plane located between the peaks and valleys of the surface profile. For this reason, paint thickness would appear to the gage to be greater than it actually is above the peaks. The procedures of section Cl 2.1.1 and 2.1.2 provide a correction for this magnetic effect of the surface profile. Actually, the distance from the plane of the peaks to the effective magnetic plane is much less than the peak-to-valley distance. A typical grit blast profile, 2.8 mils (71 microns) maximum height, increased micro test readings on a 4 mil (102 microns) paint coat by only 0.5 mils (13 microns).

DIRTY, TACKY OR SOFT FILMS: The surface of the paint and the probe of the gage must be free from dust, grease, and other foreign matter in order to obtain close contact of the probe with the paint and also to avoid adhesion of the magnet. The accuracy of the measurement will be affected if the coating is tacky or excessively soft. Tacky paint films also cause unwanted adhesion of the magnet. Unusually soft films may be dented by the pressure of the probe. Soft or tacky films can sometimes be measured satisfactorily by putting a shim on the film, measuring total thickness of paint plus shim, and subtracting shim thickness.

ALLOY STEEL SUBSTRATES: Appreciable differences in certain magnetic properties of the substrates will effect the magnetic gage readings. However, such differences among most mild low-carbon steels are insignificant. Also, atleast two of the high-strength, low-alloy steels have no appreciably different effect on the gages. For higher alloy steels, the gage response should be checked. In any event, the gage should be recalibrated on the same steel over which the coating has been applied.

PROXIMITY TO EDGES: The magnetic gages are sensitive to geometrical discontinuities of the steel, as at holes, corners or edges. The sensitivity to edge effects and discontinuities varies from gage to gage. Measurements closer than one inch (2.5cm) from the discontinuity may not be valid unless the gage is calibrated specifically for that location. It may be used as a "go, no-go" gage at such locations by setting or calibrating it for one thickness under precisely similar conditions.

PROXIMITY TO OTHER MASS OF STEEL: Some of the Type 2 gages, in particular are sensitive to the presence of another mass of steel close to the body of the gage. This effect may extend as much as three inches (7.6cm) from an inside angle.

CURVATURE OF STEEL SURFACE: Magnetic gage readings may be affected by the surface curvature in proportion to the degree of departure from flatness. If the curvature is appreciable, valid measurements may still be obtained by calibrating or setting the gage on a similarly curved surface.

TILT OF PROBE: All of the magnets or probes must be held perpendicular to the painted surface to produce valid measurements.

OTHER MAGNETIC FIELDS: Strong magnetic fields, as from welding equipment or nearby power lines, will interfere with the operation of gages. Also, residual magnetism in the steel substrate may affect gage readings. With two-pole gages in such cases, it is recommended that the readings before and after reversing the pole position be averaged. Other gages may require demagnetization of the steel.

EXTREMES OF TEMPERATURE: Most of the magnetic gages have operated satisfactorily at 40^{o} F and 120^{o} F (4^{o} C and 49^{o} C). However, if such temperature extremes are met in the field, the gage might well be checked with at least one reference standard after and the gage is brought to the same ambient temperature.

VIBRATION: The accuracy of the Type 1 (pull-off) gages is affected by traffic, machinery, concussions etc. When these gages are set up for calibration or measurement of paint films, there should be no apparent vibration.

2.2 PROCEDURE OF ADHESION MEASUREMENT

General: The adhesion measurement has to be conducted on mild steel panels painted in laboratory with the painting system and areas of painted structures in the field. The designed specification describes the tool testing conditions and procedures of evaluation.

2.2.1 CUTTING TOOL

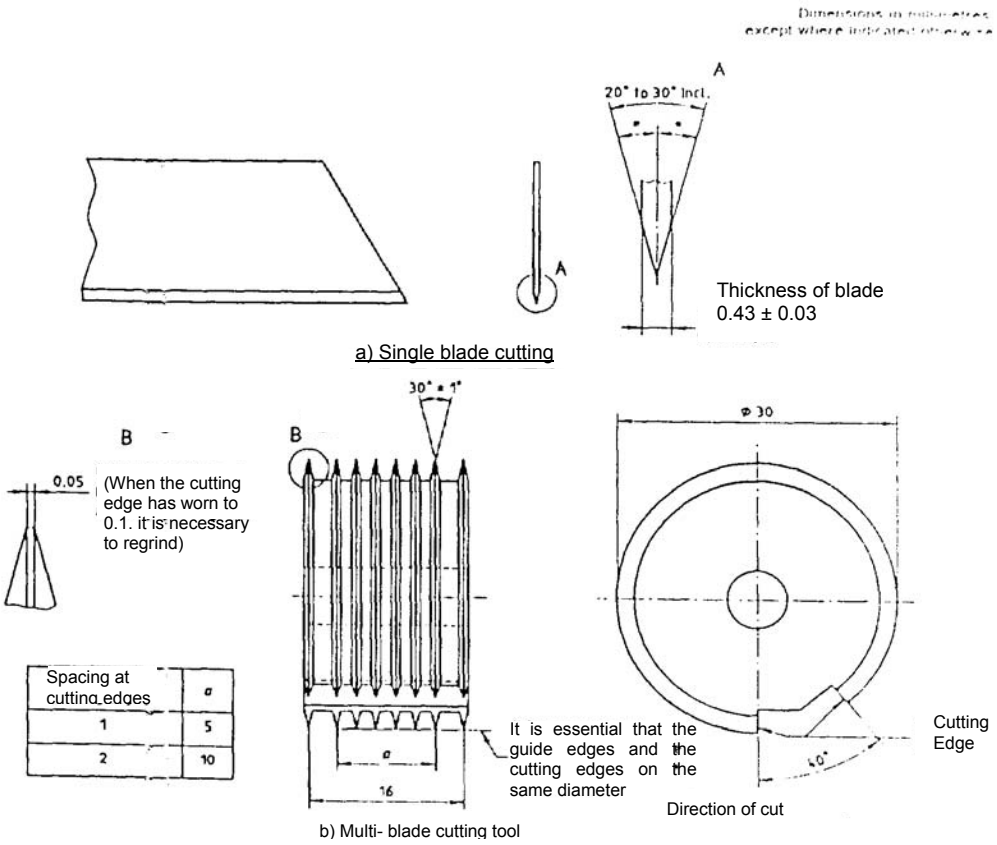
It is particularly important to ensure that the cutting tool has a defined shape and that the cutting edges are in good condition.

Suitable tools are listed below and shown in figures 1a) and 1b):

a) Single-blade cutting tool with 20 º to 30 º edge and other dimensions as specified in figure 1a).

b) Multi-blade cutting tool with six cutting edges spaced 1mm or 2mm apart.

The single-blade cutting tool is the preferred tool in all cases, i.e. with all kinds of coating on both hard and soft substrates. The multi-blade cutting tool is not suitable for thick (>120µm) or hard coatings or where the coating is applied over soft substrates.



a) Single blade cutting

b) Multi- blade cutting tool

Figure 1 - Suitable cutting tools

The tools specified in are suitable for manual use and although this is the more usual method of use, the tool may be mounted on a motor-driven apparatus which gives more uniform cutting. The application of the latter procedure shall be subject to agreement between the customer and supplier.

2.2.2 GUIDING AND SPACING EDGES

In order to space the cuts correctly, a series of guiding and spacing edges is necessary when using a single-blade cutting tool. A suitable apparatus is shown in figure 2.

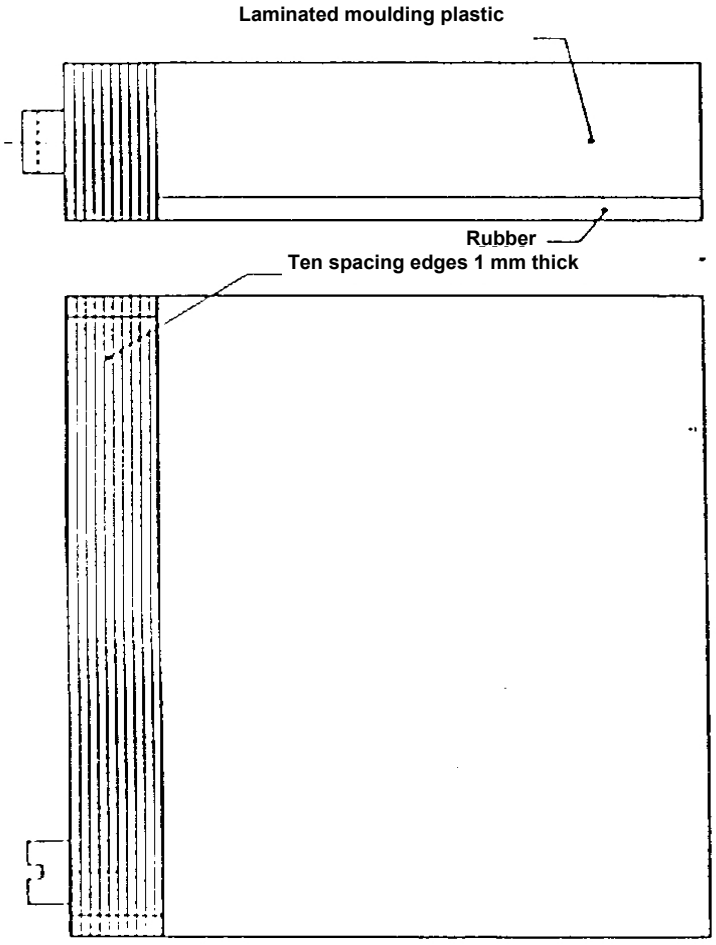


Figure 2 - Series of spacing edges

2.2.3 SOFT BRUSH: Soft painting brush to remove detached material.

2.2.4 TRANSPARENT PRESSURE-SENSITIVE ADHESIVE TAPE: 25mm wide, with a minimum adhesion strength of (8 ± 3) N per 25 mm width.

2.2.5 VIEWING LENS: Hand-held, with a magnification of X 2 or X 3.

2.2.6 TEST PANELS:
Prepare test panel as per requirement specified in relevant standard.

The panels shall be plane and free from distortion. The dimensions shall be such as to allow the tests be carried out at three different positions being not less than 5 mm from each other and from an edge of the panel.

Rectangular panels, measuring approximately 150 mm x 100 mm, have been found to be convenient.

In case of field structures plane surface must be selected to perform test.

2.2.7 THICKNESS OF COATING

Determine the thickness, of the dried coating by one of the procedures specified in this specification. Make the measurement at, or as near as possible to the positions at which the cross-cut to be made.

2.2.8 TEST CONDITIONS AND NUMBER OF TESTS

Carry out the test a temperature of (23 ± 2) º C and a relative humidity of (50 ± 5) % unless otherwise agreed

In field tests, the ambient conditions will have to be accepted and recorded.

Carry out the test in at least three different places on the test substrate if the results do not agree the differences being more than one classification unit repeat the test at three more places. If necessary using different panels and record all the results.

2.2.9 CONDITIONING OF THE TEST PANELS

Unless otherwise specified, condition the test panels immediately prior to the test at a temperature of (23 ± 2) º C and a relative humidity of (50 ± 5) % for a minimum of 16h.

2.2.10 NUMBER OF CUTS

The number of cuts in each direction of the lattice pattern shall be six.

SPACING OF CUTS

The spacing of the cuts in each direction shall be equal and shall depend on the thickness of the coating and on the type of substrate as follows:

0 µm to 60 µm	1 mm spacing, for hard substrates.
0 µm to 60 µm	2 mm spacing, for soft substrates.
61 µm to 120 µm	2 mm spacing, for both hard and soft substrates.
121µm to 250µm	3 mm spacing, for both hard and soft substrates.

CUTTING AND REMOVING THE COATING USING THE MANUAL PROCEDURE

Place the test panel on a rigid, flat surface to prevent any deformation of the panel during the test.

Perform the cutting manually following the specified procedure.

Before the test, inspect the cutting edge of the blade and maintain its condition by sharpening or replacement.

Hold the cutting tool with the blade normal to the test panel surface. With uniform pressure on the cutting tool and using the appropriate spacing guide. Make the agreed number of cuts in the coating at a uniform cutting rate. All the cuts shall penetrate to the substrate surfaces.

If it is not possible due to the hardness of the coating to penetrate to the substrate the test shall be declared invalid and so reported.

Repeat this operation, making further parallel cuts of equal number, crossing the original cuts at 90º to them so that a lattice pattern is formed.

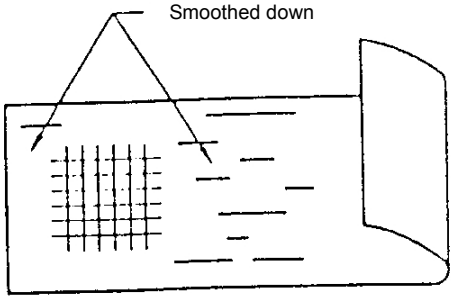
Brush the panel lightly with the soft brush several times backwards and several times forwards along each of the diagonals of the lattice pattern.

For hard substrates only, apply additionally adhesive tape. If beginning a new series of tests, remove two complete laps from a reel of the adhesive tape and discard. Remove an additional length at a steady rate and cut a piece approximately 75 mm long.

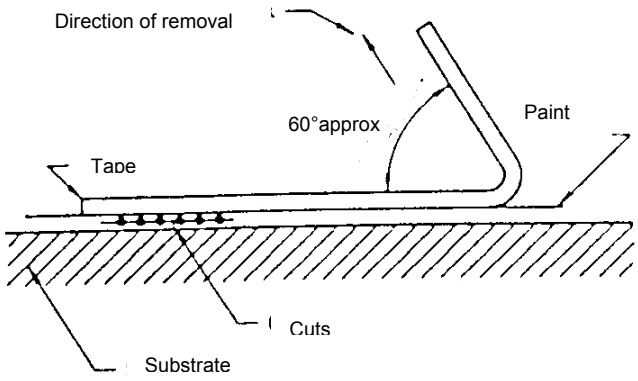
Place the centre of the tape over the lattice in a direction parallel to one set of cuts as shown in figure 3 and smooth the tape into place over the area of the lattice and for a distance of at least 20 mm beyond with a finger.

To ensure good contact with the coating, rub the tape firmly with a fingertip. The colour of the coating seen through the tapes is a useful indication of overall contact.

Within 5 min of applying the tape, remove the tape by grasping the free end and putting it off steadily in 0.5s to 1.0 s at an angle which is as close as possible to 60º (see figure 3 (b)).
Retain the tape for reference purposes for example by attaching it to a sheet of transparent film.



a) Position of tape with respect to grid



b) Position of tape immediately prior to removal from grid

Figure 3 - Positioning of adhesive tape

2.2.11 CUTTING THE COATING USING A MOTOR-DRIVEN TOOL

If the cutting tool is used with a motor-driven apparatus, take care that the points described in the manual procedure are observed, particularly with respect to the number and spacing of the cuts and the number of tests.

2.2.12 EXPRESSION OF RESULTS

Carry out the evaluation of the results as follows:

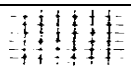
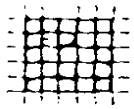
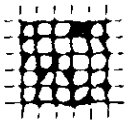
- Soft substrates: immediately following brushing
- Hard substrates: immediately following removal of adhesive tape.

Carefully examine the cut area of the test coating in good lighting using normal or corrected vision or, if agreed between the interested parties, using a viewing lens. During the viewing process, rotate the panel so that the viewing and lighting of the test area are not confined to one direction. It may be useful to examine the tape in a similar manner.

Classify the test area according to table 1 by comparison with the illustrations. Additional guidance is given by the descriptions given in table 1 to describe the results.

In table 1, a six-step classification is given. The first three step are satisfactory for general purposes and are to be used when a pass/fail assessment is required special circumstances may arise, in which case the complete six-step classification will be necessary.

TABLE – 1(ISO)

Classification	Description	Appearance of surface of cross area from which flacking has occurred (Example for six parallel cuts)
0	The edges of the cuts are completely smooth none of the square of the lattice is detached.	-
1	Detachment of small flakes of the coating at the inter sections of the cuts. A cross cut area not significantly greater than 5% is affected.	
2	The coating has flaked along the edges and/or at the inter sections of the cuts. A cross cut area significantly greater than 5% but not significantly greater than 5% is affected.	
3	The coating has flaked along the edges of the cuts partly or wholly in large ribbons, and/or it has flaked partly or wholly on different parts of the squares. A cross cut area significantly greater than 15% but not significantly greater than 25% is affected.	
4	The coating has flaked along the edges of the cuts in large ribbons and/or some squares have detached partly or wholly. A cross cut area significantly greater than 35% but not significantly greater than 65% is affected.	
5	Any degree of flaking that cannot even be classified by classification.	

For a multi-coat system report if any flaking occurs.

2.3 PROCEDURE OF GLOSS MEASUREMENT: Any commercially available glossmeter may be used which meets the requirements of measurement described in this standard.

2.3.1 *Substrate*: It shall be plate glass of mirror quality, with a minimum thickness of 3 mm and size at least 150 X 100 mm

2.3.2 Film Applicator: A block applicator having a slot ground from the undersurface to form a gap of 100 ± 2 µm deep when the applicator is placed on optically plane surface, shall be used to apply the test film. Such an applicator applies wet film of thickness approximately 50 µm, corresponding to a spreading rate of $20m^2/l$.

2.3.3 Glossmeters: The glossmeter shall consist of a light source and a lens that directs a parallel or slightly converging beam of light on to the surface under test and a receptor housing containing a lens, field stop and photoelectric cell to receive the required cone of reflected light.

a) **Geometric conditions:** The axis of the incident beam shall be at 20 ± 0.2º, 45 ± 0.5º, 60 ± 0.2º and 85 ± 0.2º respectively, perpendicular to the surface under test. The axis of the receptor shall coincide with the mirror image of the axis of the incident beam. With a flat piece of polished black glass or other front surface mirror in the test panel position, an image of the source shall be formed at the centre of the receptor field stop (receptor window). The width of illuminated area of the test panel shall be not less than 10 mm.

The angle between the axis of the receptor beam and the perpendicular shall be equal to the corresponding angle of the incident beam with same tolerance.

b) **Vignetting:** There shall be no vignetting of rays that lie within the field angles specified in.

c) **Receptor meter:** The receptor measurement device shall give an indication proportional to the light flux passing the receptor field stop within 1 percent of full scale reading.

A generalized dimensions of a 45° glossmeter is given in Fig. 4.

2.3.4 Standards:

Primary standards: The primary Standard shall either be highly polished black glass or clear glass with back and edges roughed and coated with black paint, the top surface being plane to within two fringes per centimetre, as measured by optical interference methods. It is not intended that the primary Standard should be used for daily calibration of the glossmeters.

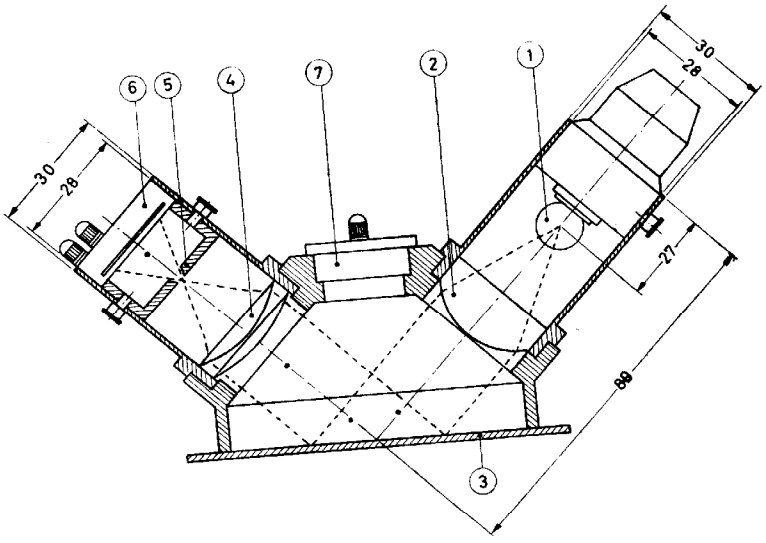
The Standard shall be highly polished clean glass, plane within 2 fringes per cm and with a refractive index N_D = 1.523 ± 0.002. The exposed area of the upper surface of glass shall have the same dimensions as the base of the search unit. The undersurface and edges of the glass shall be roughened and coated with black paint to prevent the ingress of stray light or any internal reflection.

Working standards: These standards may be of ceramic tile, vitreous enamel, opaque glass or other uniform glass materials but shall be of good planarity and should have been calibrated against a primary standard for an indicated area and the direction of illumination. Such standards shall be checked periodically by comparisons with primary standards. The working standards shall be uniform and stable and shall be calibrated by technically competent organizations. At least two standards of different glass levels, shall be available for each glossmeter geometry.

Gloss measurement techniques: Carry out the setting of glossmeter at the start of every period of operation and during operation at intervals sufficiently frequent to ensure that the instrument response is practically constant. To calibrate, adjust the Instrument to read correctly the gloss of the higher gloss working standard, then read the gloss of the lower gloss working standard. If the instrument reading for the second standard does not agree to within 1 gloss unit of the assigned value, do not use the glossmeter without re-adjustment, preferably by the manufacturer..

After calibrating the glossmeter, take three readings on test film in different positions parallel to the direction of application, checking back to the higher gloss working standard to ensure that there is no draft in readings. If the spread of results is less than 5 units, report the mean value as the specular reflection value, otherwise take three further measurements and report the mean and extremes of all six values for measurements of films on substrates other than plane glass, take six measurements preferably. Three in each of the two directions at right angles and report mean and extreme values.

IS : 101 (Part 4/Sec 4) - 1988



1. Light Source
2. Lens
3. Specimen
4. Lens
5. Diaphragm
6. Position of Photocell
7. Position of Photocell 6 for 45°—0 Diffuse Reflectance Measurement

All dimensions in millimetres.

FIG. 4 GLOSSMETER

2.3.5 Assessment of Paint Films on Substrates

Gloss measurements by this method are only meaningful for films on surfaces of good planarity because any curvature or local unevenness of substrate may seriously affect the test results. If not otherwise agreed, the direction of brush marks, raised wood grain or similar regular texture effects shall be parallel to the plane of incidence and reflection of the instrument.

Take the painted panel prepared as per regime standard and make six measurements on different areas or in different directions on the surface (except for films with directional texture, such as brush marks). If the variation between extreme values is greater than 10 units or 20 percent of the mean value, reject the test panel. Otherwise, report the mean and extreme values.

2.4 PROCEDURE OF FINISH MEASUREMENT:

Finish can be assessed from a laboratory painted panel with finish paint. The material when applied on a mild steel panel by brushing or spraying, whichever is specified, to give a dry film mass commensurate with the mass per 10 litres of the material as given in Table 2 and allowed to dry in a vertical position under specified conditions in dust free atmosphere, shall dry to a hard, firmly adherent, flexible and smooth film, free from sagging and wrinkling, with a matt semiglossy or glossy surface in accordance with the requirements of the material specification.

The film so produced shall be of normal opacity and in no way inferior to a film prepared in the same manner and at the same time from the approved sample, when examined not earlier than 48 hours and not later than 100 hours after application. In case of failure, the test shall be repeated by keeping the painted panels under standard atmospheric conditions.

Table 2

RELATIONSHIP BETWEEN DRY FILM MASS OF SINGLE COAT OF PAINT MATERIAL AND MASS PER 10 LITRES OF THE PAINT MATERIAL

Mass of the Paint Material in kg/10 litres (1)	Dry film Mass, g/m^2 (2)
Up to and including 10	17 to 22
Above 10 to 11	22 to 27
Above 11 to 12	27 to 34
Above 12 to 14	34 to 44
Above 14 to 16	44 to 54
Above 16 to 18	54 to 68
Above 18	68 to 80

3.0 TEST REPORT:

The test report shall contain the information recorded for above tests in Log sheet as descried in BHEL standards AA 067 41 06.

a) Dry film thickness as measured and averaged.
b) Sample has passed or failed when arranged as per table 1 for adhesion test.
c) Gloss percent.
d) Meets the specified finish as described in material specification and conforms to dry film mass.

4.0 REFERRED STANDARDS (Latest publications including amendments):

1. Steel structures painting council (SSPC) paint application specification No. 2. Measurement of dry paint thickness with magnetic gages.
2. Paints and varnishes- cross-cut test ISO 2409: 1992 (E).
3. Indian standards IS: 101 Part 3 and 4.

TEST METHODS FOR TEMPORATY RUST PREVENTIVES (TRP)

1. SCOPE:

This standard describes various temporary rust preventives used to provide corrosion protection. Assistance has been taken from various published national standards mentioned in clause 4 and 5 of this standard.

2. DEFINITION:

TRP is a material used to protect metal surfaces against corrosion during storage, transportation, handling. The preventive works either as a physical barrier when applied as a film or as an environment modifier when kept near the object to be protected.

One of the essential requirements of a film forming TRP is that its film should be easily removable from the substrate by petroleum hydrocarbon solvents like white spirit. Kerosene etc. even after it has been aged.

There is an important distinction between temporary rust preventive and the paints and varnishes.

Paints/Varnishes are intended to protect an article during its actual service whereas Temporary rust preventives are used during storage, transportation and handling.

3. CLASSIFICATION OF TRP:

These can be classified into the following principal groups.

a) Film forming type
b) Environment modifying type

3.1 Film forming type:

These materials leave a thin protective film on the substrate. The film can be deposited by brushing, spraying, hot dipping etc. This can be further divided into four important groups.

CORPORATE STANDARD

3.1.1 Hard film solvent deposited type, clear and pigmented

These consist of film forming ingredients dispersed dissolved in suitable solvents and can be applied by brushing, spraying and dipping. The coating is hard and abrasion resistant. Use of anti corrosive pigments (such as zinc chromate, Barium chromate) is also made where duty is more severe.

3.1.2 Soft film solvent deposited

In this case, the film formers are soft materials such as lanoline, petrolatum, plasticized bitumin. Inhibitive pigments to increase anti corrosive properties are also added. Steam washable (soft type) TRP's are similar to above except that they can be remove from the surface by steam

3.1.3 Smearing type

These materials are soft solid having grease like consistancy, Lubricating greases based on soaps such as calcium. Barium, Lithium, Lead with proved anticorrosive properties are often used.

3.1.4 Oil film type

These lubricating oils containing suitable soluble corrosion inhibitor and are free from resins and gums. These are used as protective for metal surfaces or components for short periods.

3.2 These are chemicals which change the environmental conditions around an article so that ocqurance of reactions leading to corrosion is prevented or substantially reduced. These are also called volatile corrosion inhibitors(VCI). These VCI's are usually compounds like nitrites, carbonates, chromates, benzoates and amines like Dicyclohexyl and cyclo- hexyl amine nitrite. VCIIs are available in the form of powders, tablets and solutions. VCI's coated papers are also extensively used for packaging.

VCI materials should be used with caution as they are liable to attack non-ferrous materials if free water is present. These materials can also dis-colour or damage certain painted surfaces plastics or other organic materials.

4. SAMPLING:

Sampling shall be carried out as per the methods indicated against each clause.

4.1 Film forming materials: IS: 1447, Cl. 8
4.2 VCI Powder: IS: 5730 - Appendix B
4.3 VCI coated paper: IS: 1060, Part 1

5. TESTING OF TRPS:

Important tests covered by Indian Standards are:

5.1 Consistency: IS 101

5.2 Drying time: IS 1153

5.3 Flash point: IS 101

5.4 Weight in Kg/10 litres: IS 101
5.5 Solid content: IS 101
5.6 Scratch test: IS 1153

5.7 Drainage test: IS: 1153

5.8 Test for adhesion and stickness: IS 1153.

5.9 Spreading capacity: IS 101
5.10 Water displacing property: IS.-1154
5.11 Test for freedom from corrosive effect on metal couples: IS: 1154

5.12 Test for copper strip corrosion: IS: 1154

5.13 Test for protection against corrosion at high temperature and high humidity: IS: 1153
5.14 Test for Resistance to salt spray: IS: 2074
5.15 Long term protection test: IS: 6263

5.16 Test for vapour Inhibiting Ability (VIA test), for powder: IS; 5730 & for coated paper IS: 6263

5.17 Test for stability: IS: 1154

6. RECOMMENDED TESTS FOR TRPS

In Table I, a brief description of the composition, properties and suggested tests for evaluation of various type of TRPs Is given.

TEBLE -1 SELECTION OF TESTS FOR TEMPORARY RUST PREVENTIVES (TRPS)

Sl. No.	Type of protective	Typical ingredients	Methods of application	Recommended tests
1.	Hard film solvent Deposited type.	Plasticized bitumin resins Inhibitive pigments additives, Solvents	Dipping, spraying, brushing	5.1, 5.2, 5.3, 5.4 5.5, 5.6, 5.7, 5.8 5.9, 5.11, 5.12, 5.13 5.14
2.	Soft film solvent Deposited.	Lanollne bitumen inhibitive Pigment, petrolatium Solvents	-do-	5.1, 5.3, 5.4, 5.5 5.9, 5.10, 5.11, 5.12, 5.13, 5.14, 5.17
3.	Smearing(grease Like in consistency)	Lithium, Barium, Calcium, base grases.	Smearing, brushing	5.9, 5.13, 5.14, 5.17
4.	OU type	Mineral oll with corrosion Inhibitor.	Dipping, rinsing, Spraying.	5.4, 5.9, 5.13
5.	Volatile corrosion Inhibitor:			
a)	In powder form	Solid compounds having high vapour pressure at N.T.P.	Exposure of articles in enclosed atmosphere.	5.16
b)	Coated paper			5.15, 5.16

	AMENDMENT -NOTIFICATION	AA 271 01	Rev. No. 05
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AA 271 01: INSULATING OIL

In **PREFACE SHEET and in Cl 3. 0 of page 1 of 4,** the year reference of IS:335 is modified as **"IS:335-1993(Reaffirmed 2000)".**

Please see Instructions on the reverse.

Ref : Cl. 32.4.78 OF MOM OF MRC-E	Amd No.	Approved	Issued	Date	Cum.Sr.No.
	02	MRC-E	CORP. R&D	15.01.2003	A 3406

	AMENDMENT - NOTIFICATION	AA 27101 Rev.No. 05 PAGE 1 OF 1

AA 27101: INSULATING OIL

In page 2 of 4 under Cl 6.4

' Kinematic Viscosity at 27°C': make the following correction

Incorrect	Correct
27cst, Max	20cst, max

Please see instructions on the reverse.

Ref: Fax message from BP: TSD/SM/793 dt 22 /11/99 from Bhopal	Amd.No. 01	Approved MRC (E)	Issued CORP. R&D	Date 1.12. 99	Cum.Sr.No A 2781

BHEL	CORPORATE PURCHASING SPECIFICATION	A A 271 01
		REV. No. 05
		PREFACE SHEET

INSULATING OIL

FOR INTERNAL USE ONLY
REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS

Comparable Standards:

1. INDIAN : IS:335 - 1993 Incorporating Amendments 1, 2, 3 & 4 (Reaffirmed 1987)
2. BRITISH : BS:148 - 1984 (Class I Uninhibited)
3. IECPUB : 296- 1982 (Class-I Uninhibited)

Approved Suppliers & Commercial Grades:

1. Apar Pvt. Ltd. (Special Oils Refinery Division) - Power oil
2. Savita Chemicals, Bombay - Transol
3. Madras Petrochem Ltd. Madras - Insol
4. Rinki Petrochem Pvt. Ltd. Baroda - Rinki Transformer oil
5. Sharavathy Petro Chemicals Pvt. Ltd. Bangalore -SOCIL
6. Universal Petrochemical Ltd.Calcutta - UNIVERSAL
7. Lubrichem Industries Ltd. Bombay.

User Plants & Replaced Plant Specifications/References:

1. BHOPAL	PS 27101 A
2. JHANSI	PS 27101 A
3. HYDERABAD	IS 335 - 1972
4. HARDWAR	IS 335 - 1972

Revison : Lt No TSD/SM/793 dt : 16-11-98 BHEL, BHOPAL			Approved: INTERPLANT MATERIAL RATIONALISATION COMMITTEE - MRC (E)		
Rev No. 05	Amd. No.	Reaffirmed	Prepared	Issued	Dt. of 1st issue
Dt. May '99	Dt.	Year :	BHOPAL	CORP. R& D	June '80

INSULATING OIL

1.0 GENERAL :

This specification governs the quality requirements of an unused and pure hydro carbon mineral oil, clean and free from matter likely to impair its properties and without any additive including oxidation inhibitor.

2.0 APPLICATION :

For use as a dielectric and cooling medium in Transformers, Switch gear, Capacitors and Bushings.

3.0 COMPLIANCE WITH NATIONAL STANDARDS :

There is no National standard covering the type of oil, however assistance has been draun from the following Indian Standard.

IS : 335-1993-New Insulating oils.

4.0 TEST METHODS :

Unless otherwise specified, the tests shall be conducted in accordance with relevant method of IS 335.

5.0 SAMPLE FOR TEST:

5 litres of oil shall be supplied for testing and approval purposes.

6.0 PHYSICAL PROPERTIES :

The following tests shall be carried out on the oil in 'as received' condition.

6.1 Appearance:

Shall be clear,transparent and free from suspended matter or sediment.

6.2 Density at 27°C:

0.89 g/cm^3 Max.

6.3 Interfacial Tension at 27°C :

0.04 N/m, Min.

6.4 Kinematic Viscosity at 27°C:

27 c St, Max.

6.5 Flash point, Pensky Marten (closed)]:

140°C, Min.

6.6 Water Content:

50 ppm, by weight Max.

6.7 Pour Point:

-15°C Max.

7.0 ELECTRICAL PROPERTIES:

7.1 Electric Strength (BDV):

7.1.1 As Received (New unfiltered Oil):

30 kV Min.

Note: If the above BDV value is not attained, the oil shall be filtered

7.1.2 After Filteration:

60 kV(r.m.s.), Min.

7.2 Resistivity:

At 90°C: 35×10^{12} ohm - cm, Min.

At 27°C: 1500×10^{12} ohm - cm, Min.

7.3 Dielectirc Dissipation Factor At 90°C (tan delta):

0.002, Max.

8.0 CHEMICAL PROPERTIES :

The following tests shall be carried out on the oil in 'as received' condition.

8.1 Neutralization Value (Total Acidity):

Total Acidity : 0.03 mg KOH, Max.

Inorganic Acidity/Alkalinity :

8.2 Corrosive Sulphur:

Non - Corrosive.

8.3 Oxidation Stability :

8.3.1 Neutralization Value after oxidation:

0.20 mg. KOH/g,Max.

8.3.2 Total Sludge after Oxidation:

0.05% by weight, Max.

8.4 Presence of Oxidation Inhibitor:

Shall not contain any antioxidant additives.

Note: Value of 0.05 percent Max. shall be treated as absence of oxidation inhibitor.

8.5 SK Value :

6% Max

9.0 AGEING CHARACTERISTICS:

Accelerated ageing (115° C for 96 Hours) shall be done by open beaker method with copper catalyst.

9. 1 Electrical Properties :

9.1.1 Resistivity :

At 90° C : 0.2 x 10^{12} ohm - cm, Min.

At 27° C : 2.5 x 10^{13} ohm - cm, Min.

9.1.2 Dissipation Factor (tan delta) at 90°C:

0.2, Max

9.2 Chemical Properties :

9.2.1 Total Acidity :

0.05 mg KOH/g, Max.

9.2.2 Total Sludge value :

0.05%, by weight, Max.

10.0 TEST REQUIREMENTS :

Oil samples taken after delivery at any place in India shall meet all test requirements stipulated in this specification.

11.0 TEST CERTIFICATE

Unless otherwise stated three copies of test certificates shall be sent along with each consigment.

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

The test certificates shall bear the following information.

AA 27101 : (Revision: 05) : Insulating Oil

BHEL Order No.

Batch No /Lot No.

Quantity in litres/Number of drums

Test values obtained and certificate for compliance with clauses 6 to 9.

12.0 PACKING AND MARKING :

Oil shall be delivered in perfectly clean steel drums of 210 Litre nominal capacity with flat or dished fixed ends conforming to Grade A or B of IS:1783. Inside surface of the drum may be coated with a suitable coating (e.g. epoxy lacquer, phsophate etc.) resistant to insulating oil. Outside surface of the drum shall be coated with suitable primer and finishing paint or be hot dip galvanized to IS:4759 for protection against atmospheric corrosion. The drums used shall be specially reserved for the purpose. Immediately after filling with oil the drums shall be effectively sealed so as to exclude ingress of moisture.

When stated on the order, oil shall be delivered in road tank wagons (tankers) specially reserved for this purpose and shall be suitably sealed so as to exclude ingress of moisture.

The drums/road tankers shall be indelibly marked with the following information:

AA 27101 : Insulating Oil

BHEL Order No.

Manufacturer's/Supplier's Name & Trade Mark

Batch No./Lot No.

Quantity in litres.

CHEMICAL RESISTANT HIGH BUILD EPOXIDE PRIMING PAINT

1.0 GENERAL:

This specification governs the quality requirements of two pack High Solids Epoxide Priming Paint suitable for application by brushing or spraying.

2.0 APPLICATION:

Used as primer for "Polyurethene Finishing Paint" conforming to BHEL specification AA56142 to provide protection against chemical atmosphere.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

There is no Indian standard covering this material. However, assistance has been derived from IS: 13238 & IS: 14209.

4.0 COLOUR:

As specified in BHEL order.

5.0 FINISH:

Smooth and matt or semi-gloss.

6.0 FREEDOM FROM DEFECTS:

The paint shall remain free from defects like hard setting of pigments, skinning and livering (excessive viscosity build up) during its rated shelf life.

7.0 CHEMICAL COMPOSITION:

The material shall be based on two component epoxy system suitably pigmented base and accelerator. Adequate quantity of inhibitive pigments like Zinc chlorite, zinc phosphate, etc., (Main pigment in total pigment shall be 95%, min.) shall be used. The mixing ratio of the base and accelerator shall be as per supplier's recommendation or as per type approved sample.

The type and content of the binding material as determined by infra-red spectrography or thin layer chromatography or any other suitable method shall have the weight per epoxy equivalent of 350-500 on non-volatile vehicle concentration tested as per IS:14209 or strictly adhered to the "Type Approved Sample".

8.0 TEST SAMPLES:

Tender samples will not be required when once the type approval (clause 11.0) is given and the supplier concerned declares that the material for which the tender is given is of the same quality as the type approved sample.

Representative samples of the material shall be drawn and tested as prescribed in IS:101.

CORPORATE PURCHASING SPECIFICATION

9.0 PROPERTIES:

When tested in accordance with the relevant clauses and parts of IS:101, IS:2074, defence specification 1053 and appendix 1 & 2 of this specification, the test samples shall show the following properties:

9.1 Drying Time

Surface dry : 2 hours, maximum

Hard dry : 16 hours, maximum

Intercoat interval : 16 hours, maximum

9.2 Consistency:

Smooth uniform and suitable for brush or spray applications

9.3 Fineness of grind:

5 minimum of Hegman's gauge.

9.4 Pressure Test:

The metal surface shall not be rendered visible when the two test pieces are separated after the test was carried out.

Note: Pressure test shall be carried out after 7 days curing at room temperature.

9.5 Scratch Hardness:

After the film is cured for 7 days under ambient conditions and tested on a MS panel under a load of 2000 gms, no such scratch as to show the bare metal shall be produced.

9.6 Flexibility and adhesion test

The film shall not show sing of damage or detachment or cracking when tested after 7 days curing under ambient conditions by Erichsen Cupping Test upto 8 mm.

9.7 Weight:

14 ± 0.5 kg 10 litres of mixed paint

9.8 Impact Test (Defence specification 1053)

The film shall not show any sign of damage.

9.9 Solid Content

85 %, minimum by mass

9.10 Flash Point

Not below 21°C.

9.11 Chemical Resistance Test (APPENDIX - 1)

Panels prepared and tested in accordance with Appendix 1 to this specification, when immersed in the liquids at the temperature, time and concentration specified below shall not show any sign of deterioration.

a) 10% Nitric acid by volume at 60 ± 2ºC for 12 hours
b) 20% Sulphuric acid by volume at 60 ± 2ºC for 8 hours
c) 10% Hydrochloric acid by volume at 60 ± 2ºC for 24 hours
d) 25% Sodium hydroxide by weight at 60 ± 2ºC for 12 hours
e) Petrol at room temperature for 24 hours
f) Methylethyl ketone at room temperature for 24 hours

9.12 Pot life (APPENDIX - 2)

4 to 8 hours

10.0 SAFETY PRECAUTIONS:

The paint is likely to cause irritation to the skin. This may transpire into inflammation, swelling, rash of pustules on the hands, arms and occasionally on the whole body.

Following precautions should be observed while handling this material:

1. Work place and storage rooms should be adequately ventilated.
2. Before starting the work, hands should be washed with soap and water and good barrier cream applied.
3. Maximum care should be taken to avoid splashes on the skin.
4. Splashes on the skin should be immediately washed with soap and water.
5. After the work, hands, arms and face should be washed with soap and water followed by thorough drying with a clean towel.
6. Operator should use adequate safety appliances like mask, eye protector, etc.

11.0 TYPE APPROVAL:

11.1 Samples:

Samples for type approval testing shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory to ensure continuous supply of good product.

11.2 Type Tests:

Resistance to salt Spray:

The panel prepared from the material shall show no sign of corrosion after continuous exposure for 1000 hours in salt spray cabinet.

12.0 TEST CERTIFICATES

Unless otherwise stated, three copies of test certificates shall be supplied along with each consignment giving following information:

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

BHEL order No.:
AA56109, Rev03: CHEMICAL RESISTANT HIGH BUILD EPOXIDE PRIMING PAINT
Manufacturers/suppliers Name:
Trade name/mark, if any:
Batch/Lot No.;
Date manufacture & expiry:
Test results of clause 7.0 and 9.0

13.0 KEEPING PROPERTY

When stored in covered dry place in the original sealed containers under normal temperature conditions, the material shall retain the properties prescribed in this specification for a period of 12 months after the date of manufacture which shall be subsequent to the date of placement of BHEL order.

14.0 PACKING AND MARKING

Unless otherwise stated, base and hardener shall be packed separately in steel containers of approximate capacities. Each container shall bear the following information:

AA56109: CHEMICAL RESISTANT HIGH BUILD EPOXIDE PRIMING PAINT
BHEL Order No.:
Manufacturers/ Supplier's name:
Trade name / mark, if any:
Batch/Lot No.:
Quantity supplied:
Date of manufacture & expiry: (The material shall have minimum 6 months shelf life at the time of supply)

15.0 ENVIRONMENTAL REQUIREMENTS:

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

16.0 REFRRED STANDARDS (Latest Publications Including Amendments):

1) IS:101 2) IS: 2074 3) IS:13238 4) IS:14209 5) AA56142 6) DEF:1053

APPENDIX - 1

CHEMICAL RESISTANT TEST (CLAUSE 9.11)

15 x 100 mm mild steel panels shall be first cleaned from rust by rubbing with abrasive paper and suitable solvent.

One coat of the chromate primer is applied over the cleaned panel on both sides. After 24 hours of air drying one coat of the finish paint is applied. After 24 hours another coat of the finish is applied and dried at 60 to 65ºC for 2 hours or alternatively cured for 7 days at room temperature. The sides of the panel shall be protected with wax coating.

The painted steel shall be tested by immersing in respective reagent solution in a closed desiccator and any damaging effect to the film is observed. Discolouration, softening and detachment of the film is not acceptable.

APPENDIX - 2

DETERMINATION OF POT LIFE (CLAUSE 9.12)

About 100 ml of the mixed paint prepared by mixing the base and accelerator in the recommended proportions is taken in a beaker. The paint shall be such that it should be usable by brush under a specified pot life of 6-12 hours at room temperature.

In order to see if the paint has jelled or not, a small quantity of the mixed paint is dissolved in the recommended thinner. It should not dissolve if the paint has jelled and vice-versa.

HIGH QUALITY FULL GLOSSY OUT DOOR FINISHING PAINT

1.0 GENERAL

This specification governs the quality requirements of synthetic resin, full glossy high quality air drying finishing paint.

The paint shall be capable of being brushed sprayed or flow-coated by thinning suitable with white spirit conforming to BHEL specification AA 56701.

The paint shall be compatible on surface primed with any alkyd based primer conforming to IS : 2074, IS:12744 and BHEL specification AA 56101: Anti corrosive priming paint.

The compatibility shall be checked by cross-cut Adhesion test detailed in Annexure-1.

2.0 APPLICATION

Suitable for application on the surface of outdoor equipment.

3.0 COLOUR

As specified on BHEL order.

4.0 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:2932 - 2003 : SPECIFICATION FOR ENAMEL SYNTHETIC, EXTERIOR;
(a) UNDER COATING (a) FINISHING

with additional requirements of compatibility with priming paint to IS:2074/IS:12744.

5.0 FINISH: Smooth and full glossy.

6.0 FREEDOM FROM DEFECTS:

The paint shall remain free from defects like hard settling of pigments, skinning when kept in a closed container and livering (excessive viscosity build up) during its rated shelf life.

The dried paint shall be free from defects like bittyness, floating of pigments, surface haze, orange peeling, colour fading, wrinkles, etc.

7.0 CHEMICAL COMPOSITION

7.1 Pigments and Total Solids

Only non-chalking rutile titanium dioxide shall be used as a white pigment and any other pigment used shall be light-fast. Extenders shall not be used in general. If absolutely necessary, good quality extenders upto a maximum of 5 percent may be used.

The total volume of solids in the paint shall not be less than 35%. Pthalic Anhydride content shall be 20% min. and shall be certified by the supplier.

7.2 Binder

The binder shall be long oil synthetic alkyd resin free from natural rosins and their derivatives or their modification in any form when tested in accordance with IS:101, part 9, sec 2. The composition of the binder as determined by infra-red sepctrography shall be strictly adhered to the type approved sample in bulk supply.

8.0 TEST SAMPLES

Tender samples will not be required when once the type approval is given and the Supplier concerned declares that the material for which the tender is given is of the same quality as the type approved sample.

Representative samples of the material shall be drawn and treated as prescribed in IS: 101.

9.0 PROPERTIES

Unless otherwise specified, when tested in accordance with IS:101 and IS:2932, the test samples shall show the following properties:

9.1 Drying Time

Surface dry	: 4 hours, max.
Hard dry	: 12 hours, max.
Tack free	: 24 hours, max.

9.2 Consistency

Shall be smooth, uniform and suitable for brushing.
80 to 120 seconds at 27 ±2°C when measured with Ford cup No. 4.

9.3 Gloss 60 deg (Type Test)

Above 71.

9.4 Accelerated Storage Stability Test, 60°C, 96 hours (IS:2932 Annexure F)

Shall pass the test.

9.5 Scratch Hardness after 48 hours of air drying

The test shall be carried out with 1000 g.
No scratch as to show base metal.

9.6 Flash Point

Not below 30°C

9.7 Weight

9.0 kg per 10 litres, min
However it shall be within ±3% of the approved sample of each colour.

9.8 Accelerated Weathering Test

After 21 days exposure under accelerated weathering conditions, the film shall not show any sign of general breakdown, and retain a gloss of 40% of original value.

9.9 Resistance To Acid (IS:2932 Annexure D)

The film shall not show signs of disintegration or change of colour. The loss of gloss shall not be more than 50% of the original gloss.

9.10 Resistance To Alkali (IS:2932 Annexure E)

The film shall not show signs of disintegration or change of colour. The loss of gloss shall not be more than 50% of the original gloss.

9.11 Flexibility and Adhesion

No visible damage or detachment of the film after 96 hours air-drying at room temperature followed by cooling for 5 hours at 0°C.

The test shall be carried out on the cold film, care being taken to ensure that the temperature of the panel and the rods does not exceed 0°C during the bending operation.

9.12 Fineness of Grind

Not more than 15 microns.

9.13 Compatibility with Primer to AA 56101 (IS:2074/IS:12744)

Shall pass the test, when tested as per Annexure I.

10.0 TYPE APPROVAL

10.1 Sample

Sample for type approval testing shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory to ensure continuous supply of good product.

10.2 Type Test

Outdoor Durability Test (IS:2932)

Painted panels prepared and tested as per Appendix C as per C-3 IS:2932 shall satisfy the requirements laid down in the standard for at least 12 months after painting.

11.0 TEST CERTIFICATES

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

In addition, the supplier shall ensure to enclose one copy of test certificate along with their dispatch documents / packing list to facilitate quick clearance of the material. The test certificates shall bear the following details:

1. AA 56126 (Rev.No.06) : High Quality Full Glossy outdoor Finishing paint
2. Colour:
3. Finish
4. Freedom from defects
5. Chemical composition
6. Consistency
7. Spreading capacity
8. Mass per 10 liters
9. Drying / Curing Time
10. Flash Point
11. Lead Content
12. Scratch Hardness
13. Flexibility and adhesion
14. Compatibility
15. Date of manufacture & Expiry
16. Accelerated weathering test
17. Fineness of grind
18. Resistance to acid
19. Resistance to alkali
20. Accelerated storage test

12.0 KEEPING PROPERTY:

When stored under cover in a dry place in the original sealed container at "normal temperature conditions", the material shall retain the properties prescribed in this specification for a period of not less than 12 months after the date of manufacture which shall not be earlier than one month from the scheduled delivery date mentioned in BHEL order.

13.0 PACKING & MARKING:

Unless otherwise stated, the paint shall be packed in 20 litre/ 4 litre steel drums, confirming to IS:2552 & IS:1407. Each container shall bear the following information:

1. AA 56126 : High Quality Full Glossy Outdoor Finishing Paint
2. BHEL Order No.
3. Suppliers Name
4. Type no./ Brand name / Shade
5. Date of manufacture / Batch no.
6. Expiry date
7. Special Instructions (if any)
8. Quantity

14.0 ENVIRONMENTAL REQUIREMENTS :

The supplier shall furnish Material Safety Data Sheet **(MSDS)** covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal alongwith each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

15.0 REFERRED STANDARDS (Latest Publications Including Amendments):

1. IS : 101
2. IS:1407
3. IS:2074
4. IS:2552
5. IS:2932
6. IS:12744
7. IS 13262
8. AA 56101
9. AA 56126
10. AA 56701
11. ASTM D 3359

ANNEXURE - 1 (Cl. 1 & 9.13)

TEST FOR COMPATIBILITY OF FINISHING PAINT (AA 561 26) WITH PRIMER (AA 561 01)

The compatibility of finishing paint to AA 561 26 with primer AA 561 01 shall be checked by tape adhesion test generally in line with ASTM D-3359 except for the following changes as per performance requirement of the paint system.

The adhesion tape used shall be transparent cellulose tape conforming to IS:13262. Tape bearing BIS Certification mark is also acceptable.

2 coats of finishing paint to AA 561 26 are to be applied over 2 coats of primer to AA 561 01 on cleaned and emeried steel plate of size 150x100 mm. Each primer finish coat to be applied after 24 hrs. drying of previous coat without any roughening by emery.

Adhesion test shall be performed after 48 hours of air drying of final coat. Test panels are to be dried at ambient temperature.

Method - B shall be followed and acceptance criteria will be 4B Viz. Small flakes of the coating are detached at intersections and less than 5% of area is effected.

CHEMICAL RESISTANT CHLORINATED RUBBER BASED FINISHING PAINT

1.0 GENERAL:

This specification governs the quality requirements of Chemical Resistant Chlorinated Rubber Based Paint which shall be capable of being brushed or sprayed by suitable thinning with Toluole or xylole, Industrial solvent Grade Conforming to Corporate Purchasing Specifications AA56702 and 56703 respectively.

The paint shall be compatible on surfaces primed with primer conforming to Corporate Purchasing Specification AA56105 - Epoxide Priming Paint or AA56107 - Chemical Resistant Chlorinated Rubber Based Priming Paint.

2.0 APPLICATION:

Used for protection of equipment subjected to humid, marine and highly corrosive industrial atmosphere.

3.0 COLOUR:

As specified on our order.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

There is no Indian standard covering this type of material..

5.0 FINISH:

Smooth and fully glossy.

6.0 FREEDOM FROM DEFECTS:

The paint shall remain free from defects like hard settling of pigments, skinning when kept in closed container and livering (excess viscosity build up) during its rated shelf life.

The dried paint film shall be free from defects like bittyness, floating of pigments, surface haze, orange peeling, colour fading, wrinkles, etc.

7.0 CHEMICAL COMPOSITION:

The paint shall be composed of good quality chlorinated rubber based resin modified with chemically inert plasticizers and anti – fungus additives. Suitable anti-corrosive pigments may be added to give the colour specified.

The composition of the bulk supply as determined by infrared spectrography or thin layer chromatography or any other suitable method shall be strictly adhered to the type approved sample.

CORPORATE PURCHASING SPECIFICATION

8.0 TEST SAMPLES:

Tender samples will not be required when once type approval (Clause 10.0) is given and the supplier concerned declares that the material for which the tender is given is of the same quality as the type approved sample.

Representative samples of the material shall be drawn and tested as per in IS 101.

9.0 PROPERTIES:

When tested in accordance with the relevant clauses and parts of IS 101 and IS 2074 : Part 1, the test samples shall show the following properties:

9.1 Flash Point:

Not below 30ºC

9.2 Mass per Ten Litres:

11 ± 0.5 kg

9.3 Drying Time:

Surface dry	:	1 hour maximum
Hard dry	:	24 hours maximum
Tack free	:	24 hour maximum

9.4 Gloss:

70 percent at 45º Gloss Head minimum when supplied.

9.5 Flexibility and Adhesion:

No visible damage or detachment of the film shall take place.

9.6 Protection against Corrosion under Conditions of Condensation:

The painted panel shall not show any sign of deterioration and the metal surface no sign of corrosion.

9.7 Consistency:

100 ± 10 seconds in cup No. 4 to IS 3944 at 27 ± 2ºC

9.8 Spreading Capacity:

13 to 15 square metres minimum per litre

9.9 Scratch Hardness:

After the panel is air dried for 48 hours and tested under a load of 1,000 g, no such scratch as to show the bare metal shall be produced.

9.10 Resistance to Salt Spray:

The panel prepared from the material shall show no sign of corrosion after continuous exposure for 4 days in salt spray cabinet.

9.11 Facing and Rubbing Properties:

Wet rubbing shall be done after 16 hours of application. There shall be no peeling of the film and water-proof emery paper of 220 grade should not get clogged with the paint. The painted surface shall be smooth and scratch free.

10.0 TYPE APPROVAL:

10.1 Samples

Samples for type approval testing shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory to ensure continuous supply of good products.

10.2 Type Test:

10.2.1 Outdoor durability test:

Panels prepared as per Appendix A, but with the primer and finish paints as per this Specification and tested as per Annex. C of IS 2932 : Part 1, shall satisfy the requirements laid down in Annex. C for at least 18 months after painting.

11.0 TEST CERTIFICATES

Unless otherwise specified, three copies of test certificates shall be supplied along with each consignment giving following information:

AA56136, (Rev.03): Chemical Resistant Chlorinated Rubber Based Finishing Paint
BHEL order No.:
Batch/Lot No.;
Manufacturers/suppliers Name:
Trade name/mark, if any:
Date manufacture and expiry:
Test results of clause 7.0, 9.0 and 10.0

12.0 KEEPING PROPERTY

When stored in covered dry place in the original sealed containers under normal temperature conditions, the material shall retain the properties prescribed in this specification for a period of 12 months after the date of manufacture, which shall be subsequent to the date of placing the order.

13.0 PACKING AND MARKING

Unless otherwise stated, the paint shall be packed in 20 litres steel drums.

Each container shall bear the following information:

AA56136: Chemical resistant chlorinated rubber based finishing paint
BHEL Order No.:
Batch No.:
Manufacturers/suppliers Name:
Trade name/mark, if any:
Date manufacture and expiry:
Quantity supplied:

14.0 REFRRED STANDARDS (Latest publications including amendments):

1. IS 101	2. IS 2074	3. IS 2932 : Part 1	4. IS 3944
5. AA56105	6. AA56107	7. AA56702	8. AA56703

INDUSTRIAL TOLUOLE

1 GENERAL

This specification governs the quality requirements of Industrial Toluole.

2 APPLICATION

Suitable for use as an industrial solvent and especially as a thinner for paints and varnish industry.

3 COMPLIANCE WITH NATIONAL STANDARDS

There is no national standard covering this material; however, assistance has been drawn from IS 536 – 968 (withdrawn). Varnish shall meet the requirements of this specification.

4 FREEDOM FROM DEFECTS

The material shall be clear and free from sediments, suspended matter and undissolved water.

5 COMPOSITION

The material is derived by suitable fractionation and refining of crude benzole obtained by extraction from the gas produced by carbonization of coal in coke ovens and retorts or recovered as a by - product in petroleum refining or petrochemical operations.

6 TEST SAMPLE

Test sample shall be drawn/ supplied for testing and approval as per appendix 'E' of IS: 536.

a) To draw a representative sample, the contents of the container selected for sampling shall be mixed as thoroughly as possible by shaking or stirring or both or by rolling, so as to bring all portions into uniform distribution.

b) The samples shall be taken in a suitable, clean, dry air-tight glass bottle of one litre capacity. It should be almost but not completely filled by the sample.

c) In case of failure of first sample, two samples shall be drawn from other two drums of the same consignment at random and failure of the second sample in complying with the specification will lead to the rejection of the whole consignment.

7 PROPERTIES

When tested in accordance with the test methods shown against each, the test sample shall show the following properties:

7.1 Colour (Cl.5 of IS: 82)

Shall not be darker than a freshly prepared solution of 0.8 ml of 0.1 N Potassium dichromate and 12 ml of 0.1 N cobalt sulphate made upto 1000 ml with water.

7.2 Specific Gravity (Cl.6.3.3. IS 82)

7.2.1 at 15.5°/15.5°C :

0.860 to 0.875

7.2.2 at 27°/27°C

0.849 to 0.864

7.3 Distillation Range (Cl.7, IS: 82)

7.3.1 Upto 105°C

5 ml maximum

7.3.2 Up to 120°C

90 ml minimum

7.4 Residue on Evaporation (Cl.8, IS: 82)

10 mg per 100 ml, maximum.

7.5 Acid Wash Test (Cl.13 IS 82)

The acid layer shall be clear and not darker than a solution of 1.5 g of potassium dichromate in 1000 ml of dilute sulphuric acid (1:1 by volume).

7.6 Neutrality Test (Appendix A, IS 536)

Shall not give an acid reaction when tested with mixed indicator.

7.7 Sulphur Corrosion Test (Appendix B, IS 536)

Material shall not produce a stain darker than that produced by a standard sample containing 12 mg per litre (13.7 mg per kg) of elemental sulphur in sulphur free benzene.

7.8 Total Sulphur (Appendix C, IS 536)

0.2 %, maximum by mass

7.9 Hydrogen Sulphide (Appendix D, IS 536)

Shall pass the test.

7.10 Mercaptans (IS 1448- P: 19)

Shall give no positive reaction.

8 TEST CERTIFICATES

Unless otherwise stated, three copies of test certificate shall be supplied along with each consignment giving following information:

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.

– AA56702, Rev. 05: INDUSTRIAL TOLUOLE
– BHEL Order No.
– Batch / Lot No.
– Supplier's/ Manufacturer's Name and Trade mark, if any
– Date of manufacture
– Test results of clause 7

9 SAFETY PRECAUTION

Material is highly flammable and shall be stored in securely closed leak proof metal containers protected from light in a cool place.

10 PACKING & MARKING

The material shall be packed in securely closed leak proof metal containers which shall be dry, clean and free from substances soluble in toluole.

Each container shall marked with the following information:

– AA56702: INDUSTRIAL TOLUOLE
– BHEL Order No.
– Supplier's / Manufacturer's Name and Trade mark, if any
– Batch No. /Lot No.
– Date of manufacture
– Quantity supplied

A caution label “HIGHLY FLAMMABLE” together with the corresponding symbol for labelling of dangerous goods shall be affixed on each container.

11 ENVIRONMENTAL REQUIREMENTS

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

12 REFERRED STANDARDS (Latest Publications Including Amendments)

1) IS 82
2) IS 1448

XYLOLE, INDUSTRIAL – SOLVENT GRADE

1 GENERAL

This specification governs the quality requirements of Xylole, Industrial-solvent grade.

2 APPLICATION

Suitable for use as an industrial solvent and especially as a thinner for paints.

3 COMPLIANCE WITH NATIONAL STANDARDS

Since the nation standard IS 359 had been withdrawn varnish the shall meet the requirements of this specification.

4 FREEDOM FROM DEFECTS

The material shall be clear and free from suspended matter and undissolved water.

5 COMPOSITION

The material shall be derived from Crude Bezole obtained by extraction of the gas produced from coal in coke oven and reports, by suitable fractionation and refining after the removal of bezole and toluote or recovered as a product in the petroleum refining or petrochemical operations.

6 TEST SAMPLE

a) To draw a representative sample, the contents of the container selected for sampling shall be mixed as thoroughly as possible by shaking or stirring or both or by rolling, so as to bring all portions into uniform distribution.

b) The samples shall be taken in a suitable, clean, dry air-tight glass bottle of one litre capacity. It should be almost but not completely filled by the sample.

c) In case of failure of first sample, two-sample shall be drawn from other two drums of the same consignment at random and failure of the second sample in complying with the specification will lead to the rejection of the whole consignment.

Test sample shall be drawn/ supplied for testing and approval as per appendix 'D' of IS: 359.

7 PROPERTIES

Visual Inspection:

The material shall be clean free from dust and any other imparitives when tested in accordance with the test methods shown against each, the test samples shall meet the following requirements

Unless specified otherwise, tests shall be conducted as prescribed in relevant parts and section of Indian standard IS: 101 and IS: 14946. The test panels shall preferably be prepared on blast cleaned surface.

8 Colour (Cl.5 of IS: 82)

Shall not be darker than a freshly prepared solution of 0.8 ml of 0.1 N Potassium dichromate and 12 ml of 0.1 N Cobalt sulphate made upto 1000 ml with water.

8.1 Specific gravity (C1.6.3.3. of IS:82)

8.1.1 At 15.5°/15.5°C

0.860 to 0.875

8.1.2 At 27°/27°C

0.850 to 0.875

8.2 Mercaptans (IS: 1448, Part 19)

Shall give no positive reaction.

8.3 Residue on evaporation (C1.8 of IS: 82)

10.0 mg per 100 ml maximum.

8.4 Distillation range (IS: 1448, Part 18; Part 1)

Difference between initial and final boiling points shall not be more than 5°C. Lower boiling point shall not be less than 137°C and the highest boiling point shall not exceed 145°C.

8.5 KEEPING PROPERTY

The containers shall be securely closed, protected from light and shall be stored in a cool place. Except when they are opened for the purpose of cleaning and rendering them free form Xylole vapour, all empty tanks or other containers shall be kept securely closed unless they have been thoroughly cleaned and free from Xylole vapour.

8.6 Acceptance Clause

The material shall be accepted on the basis of test values & clause 8.1, 8.1.2, 8.2, 8.3

9 TEST CERTIFICATES

Three copies of test certificates shall be supplied along with each consignment, giving the following information:

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

– AA56703, Rev. 04: XYLOLE, INDUSTRIAL – SOLVENT GRADE
– BHEL Order No.
– Batch / Lot No.
– Supplier's/ Manufacturer's Name and Trade mark, if any
– Date of manufacture
– Test results of clause 8.

10 Environmental Requirements

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable”

11 PACKING & MARKING

The material shall be supplied in leak proof steel drums of 20 or 200-25 litres capacity as stated in BHEL order. Containers shall be dry, clean, free from substance, soluble in Xylole.

"A caution label" Flammable" together with the corresponding symbol for labelling of dangerous goods shall be affixed on each container"

Each container shall bear the following information:

– AA56703:XYLOLE, INDUSTRIAL – SOLVENT GRADE
– BHEL Order No.
– Supplier's / Manufacturer's Name and Trade mark, if any
– Batch No.
– Date of manufacture
– Quantity supplied

12 REFERRED STANDARDS (Latest Publications Including Amendments)

1) IS: 82
2) IS 1448, Part 19
3) IS 1448, Part 18
4) IS 1448, Part 1

13 PROPERTIES

The material shall meet the following technical requirements:

13.1 DRYING TIME

– Surface dry : 15 minutes, max.
– Hard dry : 2 hrs. min.
– Time to topcoat : 24 hrs. min.

13.2 CONSISTENCY

The liquid component mixed with powder shall be suitable for application by spray as such or when thinned in the proportions at specified by the manufacturer.

13.3 FLASH POINT

Not below 15°C

13.4 MASS PER TEN LITRES

20 kgs., min.

13.5 VOLUME SOLIDS

60% , min.

13.6 POT LIFE OF MIX (ANNEXURE D OF IS: 14946)

4 hrs. min. at 30°C

13.7 DRY FILM THICKNESS

65-75 microns per coat when measured after 72 hrs. of curing.

13.8 RESISTANCE TO SALT SPRAY TEST (TYPE TEST)

The material shall pass resistance to salt spray test, when test panels cured for 72 hrs. are subjected to continuous exposure for 2000 hrs.

13.9 PROTECTION AGAINST CORROISION UDNER CONDITIONS OF CONDENSATION (TYPE TEST)

The material shall pass the test, when test panels cured for 72 hrs. are subjected to exposure at specified conditions for 2000 hrs.

13.10 HEAT RESISTANCE TEST

The film shall not show signs of cracking, blistering or flaking when coated test panels air-dried for 48 hrs., are kept at 400±10°C for 6 hrs followed by plunging in cold water-three cycles, min.

13.11 COMPOSITION

13.11.1 SOLID CONTENT

68%, min. by weight of mixed paint.

13.11.2 TOTAL METALLIC ZINC CONTENT (ANNEXURE B OF IS: 14946)

75%, min. by weight in non-volatile portion of the paint.

13.12 MUD-CRACKING TEST

The coating applied to dry film thickness of 120 microns minimum, shall not show any mud cracking when viewed under 10 X magnification.

13.13 SEDIMENTATION TEST

There shall not be any segregation of zinc powder form the base material within 2 hrs in the

mixed paint.

13.14 CURE TEST

The coated test panels air dried for 48 hrs shall pass the cure test when tested according to test procedure given in ASTM D 4752.

14 KEEPING PROPERTY

When stored in covered dry place in the original sealed containers under normal ambient conditions, the liquid portion shall not show thickening, curdling, gelling or hard caking and also retain the properties of mixed paint prescribed in this specification for a period of six months from date of delivery.

15 TEST CERTIFICATES

Unless otherwise stated, three copies of test certificates and product data sheet shall be supplied along with each consignment giving following information:

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

- AA56703, Rev. 04: XYLOLE, INDUSTRIAL – SOLVENT GRADE
- BHEL Order No. & Date
- Batch / Lot No.
- Supplier's/ Manufacturer's Name and Trade mark, if any
- Quality supplied
- Date of manufacture and expiry
- Test values as per clause 9
- Mixing ratio
- Technical information, if any:

16 PACKING AND MARKING

Unless otherwise stated, the components of paint shall be supplied separately in moisture and leak proof containers in packing size as specified in the BHEL order.

Each container of the consignment shall bear the following information printed or pasted at suitable place so as to protect it from damage during transportation and handling:

- AA56703: XYLOLE, INDUSTRIAL – SOLVENT GRADE
- BHEL Order No. & Date
- Batch / Lot No.
- Supplier's/ Manufacturer's Name and Trade mark, if any
- Name of contents:
- Mixing ratio:
- Quantity in container
- Date of manufacture and expiry
- Technical information, If any:

17 ENVIRONMENTAL REQUIREMENTS

The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during their transportation, storage, handling and disposal along with each supply.

Each container shall be marked with corresponding symbol and minimum worded cautionary notice for flammable / corrosive / toxic / harmful / irritant and oxidizing etc. as applicable.

18 PRECAUTIONS

d) Use off the mixed paints within stipulated pot life i.e., 4 hrs after mixing and should be continuously agitated during application.

e) Inorganic Zinc silicate primer should not be applied at relative humidity below 50% and the surface should remain free from condensation at the time of application.

f) After completion of the work, the application equipment must be cleaned thoroughly immediately with thinner and kept safely for next use.

g) The surface to be painted must be blast cleaned to Sa 2 ½, min. and the painting shall be done by spray method uniformly. However, brush may be used for touch up of local areas only.

19 REFERRED STANDARDS (Latest Publications Including Amendments)

1) IS: 101
2) IS: 14355
3) AA0674101
4) ASTM D4752

Annexure-V

Techno-Commercial Requirement

Tender Enquiry No.	**TE No136/2022-23 dated 04.02.2023**
Description	**Rate Contract for Procurement of Paint,Primer and Thinner**

Technical and Other Requirements			**Supplier's Remarks**
Sl No	**Description**	**BHEL's Requirement**	**Submitted**
1	Registration / Empanelment Requirement: Contract shall be awarded to only such sellers, who are registered / empanelled / approved / enlisted with NTPC/PVUNL for Patratu Project for the required goods category on the date of bid opening. Prospective bidders (if not already registered), are advised to get themselves registered with the said registration authority before bid opening date.	Confirmation	Yes/No
2	Supplier to provide Shelf Life Certificate, Test Certificate and Guarantee Certificate as per applicable standards or specifications of BHEL along with each lot of supply. Shelf Life of material must be minimum 1 year from date of its manufacturing.	Confirmation	Yes/No
3	Prices shall be FIRM and valid for ordering up to 9 months from date of RC.	Confirmation	
4	GST Registraion Certificate	To be submitted	Yes/No
5	Registraion Certificate under MSME Act if applicable (Udyam Certificate)	To be submitted	Yes/No
6	Self-Declaration on Class I/Class II/Non Local under Make in India	Seal and signed	Yes/No
7	Declaration by vendor for Sister Concern	Seal and signed	Yes/No
8	MSE owned by SC/ST declration if applicable	Yes/No, If Yes Submit supporting Document	Yes/No
9	MSE owned by Women declration if applicable	Yes/No, If Yes Submit supporting Document	Yes/No
10	Signed Integrity Pact	Seal and signed	Yes/No
11	Contact Person	To be given	
12	Contact Email Id	To be given	
13	Contact Number	To be given	
14	Acceptance of NIT, STC and GTC terms and conditions	Yes/No	Yes/No
	Remarks If Any		

Bidder's Seal and Sign