

RAIL COACH FACTORY, KAPURTHALA

**MD35131**

**Dated 02.08.2022**

**Sub:** Issue of specification No. MDTS 48279 Rev.-04.

Please find enclosed a copy of following specification for information and necessary action:

S. No	Description	Specification No.
1.	TECHNICAL SPECIFICATION FOR ADHESION PROMOTING PRIMER	MDTS 48279 Rev.-04.

**SME/DESIGN**

CQM CPLE  
Dy.CMM/LHB/Fur.

CWE/Fur  
Dy.CMM/G

CMM/ HSQ  
CMT

CMM/TKJ  
Dy. CPLE-I,II

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स्थापित: 1986

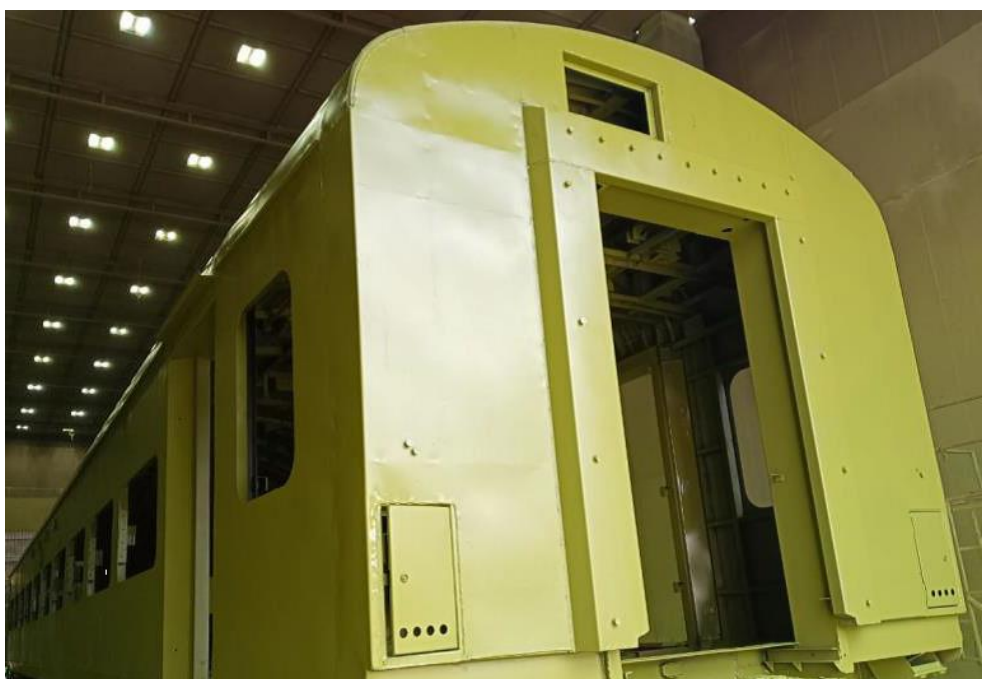


**RCF**

**KAPURTHALA**

Government of India  
Ministry of Railways  
Rail Coach Factory  
Kapurthala  
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ESTT: 1986

ऐड्हीशन को बढ़ावा देने वाला प्राइमर के लिए तकनीकी विनिर्देश  
TECHNICAL SPECIFICATION FOR ADHESION  
PROMOTING PRIMER



Specification Number	MDTS 48279		
Revision Number	04	Date of Issue	02/08/2022

**BRIEF DESCRIPTION**

This standard covers scope, scope of supply, important Instructions, technical requirements etc. for adhesion promoting primer (two packs) for the interior/exterior painting of railway coaches.

The adhesion promoting primer is applied directly on stainless steel and also works on Corten steel substrate, for interior as well as exterior application. It eliminates Garnet blasting from operation.

## **FOREWORD**

This technical specification is prepared for requirements of various parameters and fire properties of adhesion promoting primer.

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### LIST OF REVISION/AMENDMENTS

S.No.	Amendment Date	Revision	Details of changes
1.	21.04.2017	Rev.01	Specification revised. Amine Value of Part B, Hot water resistance, Humidity Resistance, Salt spray resistance & prototype approval added. Para 2.5 deleted
2.	04.07.2018	Rev.02	<ul style="list-style-type: none"> <li>Fire properties as per EN45545 and % Pigmentation in base and (SN. 22-23) added in Table-II.</li> <li>Testing on MS test panel added for salt spray, humidity &amp; hot water tests (Para's 7-9 of Table-III).</li> <li>Para 1.2 of Chapter-I &amp; Prototype approval (Para 5) of Chapter-II modified. Fineness of grind (Para 16), Hot water resistance (Para 18) and Humidity resistance (Para 19) of Table-II modified.</li> <li>Classification of test (para 6) of Chapter-II added.</li> </ul>
3.	13.09.2019	Rev.03	<ul style="list-style-type: none"> <li>Para 7.0 Warranty clause added.</li> </ul>
4.	02.08.2022	Rev.04	<ul style="list-style-type: none"> <li>Amendment 1 incorporated.</li> <li>Warranty clause deleted.</li> <li>Specification modified.</li> </ul>

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#### LIST OF STANDARDS REFERRED:

SN	Standard	Title
1.	IS : 101-86	Methods of Sampling and test for paints, varnishes and related products.
2.	ASTM D 3359-02	Standard Test Methods for Measuring Adhesion by Tape Test.
3.	ASTM D 4541	Standard Test Method for Pull-Off Adhesion Strength.
4.	ASTM D 2794	Standard Test Method for Impact Resistance.
5.	IS:13213Annexure-E	Standard Test Method Determination of pot life.
6.	ISO 9702	International Standard for Determination of Amine Value.
7.	ASTM D 870	Standard Test Method ForDetermination of Hot water resistance.
8.	ASTM D2247	Standard Test Method ForDeterminationof Humidity Resistance.
9.	ASTM B117	Standard Test Method ForDeterminationof Salt spray resistance.
10.	EN 45545-2	European standard for Fire Properties test.
11.	ASTM D2698	Standard Test Method for Determination of the %Pigment Content of Solvent.
12.	IS:2500	Sampling procedures for inspection.

#### LIST OF ABBREVIATION/TERMINOLOGY:

S.N.	Abbreviation /Terminology	Expansion/Explanation
1.	RH	Relative Humidity
2.	DFT	Dry Film Thickness
3.	IS	Indian Standard
4.	ASTM	American Society for Testing and Materials
5.	ISO	International Organization for Standardization
6.	FAI	First Article Inspection
7.	QAP	Quality Assurance Plan
8.	HL3	Hazard Levels 3
9.	S.S.	Stainless Steel
10.	CDE	Chief Design Engineer
11.	RCF	Rail Coach Factory
12.	PO	Purchase Order
13.	NABL	National Accreditation Board for Testing and Calibration Laboratories
14.	KXH	Indian Railways station code for Kapurthala
15.	OEM	Original Equipment Manufacturer
16.	IRIS	International Railway Industry Standard

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## 1. Introduction:

The adhesion promoting primer is applied directly on stainless steel and Corten steel substrate, for interior as well as exterior application in Indian Railways Passenger Coaches. Adhesion promoting primer makes the surface of the metallic substrate ready for painting application. This specification consists of technical and physico-chemical requirements of Adhesion promoting primer.

## 2. Scope:

This standard specifies requirements and methods of testing of Adhesion Promoting Primer supplied in two packs, intended to be used, for Indian Railway coaches. Two components Adhesion Promoting primer is intended to be used as first coat on bare metal to provide etching and adhesion to stainless steel and mild steel surface. The material shall have good adhesion on the substrate and shall have good compatibility with subsequent coats of two pack unsaturated polyester based putty, two pack Epoxy Zinc Phosphate Primer, two pack polyurethane based under coat paint and two pack polyurethane based top coat paint, sound insulation paint as the painting system may require the application of these materials. The primer should be suitable for spray application (as per application note) also for application by brush for touching up smaller areas. This standard covers surface preparation, technical requirements, important instructions etc. for adhesion promoting primer (two packs) for the interior/exterior painting of railway coaches.

### 2.1. Scope of supply:

The scope of supply for each set shall include the following unless otherwise stipulated in the tender:-

- i) Adhesion promoting primer (two pack)
- ii) Thinner (if required)
- iii) Metal conditioner

### 2.2. Important instructions:

#### A. For manufacturers:

The paint Manufacturers shall indicate the presence of un-reacted monomer in the system to ensure freedom from pollution hazards.

#### B. For Testing Authorities:

All the paint shall be tested in as supply condition after mixing pack A&B in 3:1 ratio or as per manufacturer's recommendations. No thinner shall be employed until recommended by the manufacturer; All the characteristics specified shall be tested in this mixture as per specification at the time of initial approval. All the tests except long duration test like salt spray, protection against corrosion under condition of condensation and accelerated test for durability will be carried out whenever it is required by purchaser/inspection agency.

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**C. For Coach Builders:**

- a. Normally addition of thinner in prepared paint (obtained after mixing Pack A& Pack B in recommended mixing ratio) shall not be required. If environmental fluctuations (e.g. fall in temperature) take place, then small amount of thinner as recommended by the manufacturer, subject to a maximum of 10% (v/v), may be added to adjust the spray viscosity.
- b. For ensuring adherence to flash off time, after the painting operation, the coach shall be placed at the entrance of the curing oven and the coach shall be moved inside the oven slowly to cover the stipulated flash off time.

**3. Terminology:**

- 3.1 **Pack** :The term used to describe each of the two packs of the paint which when mixed together, form an Adhesion Promoting priming paint.
- 3.2 **Paint** :The mixture of the 2 packs, along with thinner, in the proportion recommended by the manufacturer.
  - 3.2.1 Pack A: (Normally referred to as base) shall consist of  
(a) Acrylic resin (b) Epoxy ester Resin (c) Pigment
  - 3.2.3 Pack B : Normally referred to as Hardener or catalyst solution
  - 3.2.4 **Metal conditioner** :The supplier has to supply suitable and compatible metal conditioner along with the two pack adhesion promoting primer.

**4. Composition:**

- 4.1 The mixing ratio of the pack A and pack B shall be simple ratio and same as supplied in dual containers.
- 4.2 The paint shall consist essentially of two packs, namely Pack A and Pack B.The mixing of the two packs shall be done as specified by the manufacturer. (the rise in temperature shall not be more than 5°C).

**5. Properties:**

- 5.1 General: The paint shall comply with the requirements specified in Table I of this specification.
- 5.2 The preparation of metal panels shall be in accordance with Clause 5.2.1.1 of IS:101- 86.
- 5.3 All the tests shall be conducted at room temperature ( $27 \pm 2^{\circ}\text{C}$ ) and a relativehumidity at  $65 \pm 5\%$  in a well-ventilated chamber free from draughts and dust.
- 5.4 Condition in Containers: Each component as delivered shall be free of gel, coarse particles, skins, foreign matter and sediments. Any sediment that does form must

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be easy to stir up with a high speed stirrer for 15 minutes maximum, in order to give a homogenous paint.

- 5.5 The two packs i.e. base and hardener shall be mixed in the ratio as recommended by the manufacturer, before conducting the tests. Where the paint is required to be applied on panels, it shall be done so by suitable spray. After mixing the two components thoroughly, an induction time of 10 to 15 minutes shall be allowed before use.

#### **Technical Requirements For Adhesion Promoting Primer(Two Pack)**

<b>S. No.</b>	<b>Characteristics</b>	<b>Requirements</b>	<b>Test Method</b>
1.	Drying time (a) Surface Dry, max (b) Hard Dry, max (c) Hard Dry at 70°C,max	20 Minutes 1 hour 30 minutes, with 15 minutes flash off time	IS : 101-86 (Part 3/ Sec. 1)
2.	Consistency	Smooth and uniform, suitable for brush/spray application	IS : 101-89 (Part 1/ Sec.5)
3.	Finish	Smooth and Matt to Satin	IS : 101-87 (Part 3/ Sec. 4)
4.	Colour	Self standard Yellow Green	IS: 101-89 (Part 4/ Sec. 2)
5.	Dry film thickness/Per coat, min.	35-45 microns	IS: 101- 89 (Part3/Sec.2) By Elcometer/thickness gauge meter
6.	Volume solids, %, min	33.0	IS: 101-93( Part 8/Sec 6)
7.	Flexibility & Adhesion (6.25mm mandrel)	No visible damage or detachment of film	IS: 101-88 (Part 5/Sec. 2)
8.	Cross Cut Adhesion 1mm cuts	Should be minimum 4B on non blasted SS	ASTM D 3359-02
9.	Pull off Adhesion	Min 850 Psi on non-blasted SSsurface	ASTM D 4541
10.	Flash Point (a) Component A (b) Component B	Above 17°C Above 17°C	IS: 101-87 (Part 1/ Sec. 6)
11.	Impact Resistance – Direct and reverse 50 cm height, 1kg weight, 12 mm dia.	No crack observed	ASTM D2794

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12.	Keeping Properties for both the packs	Min. 12 months	See Appendix-II
13.	Mass in Kg/10 liters,	11.5-14.0	IS : 101-87 (Part 1/ Sec.7)
14.	Pot life(After induction time) at i) 27 ± 2°C, min ii) 40 ± 2°C, min	4hours 3 hours	IS: 13213 Annexure-E or Appendix-I
15.	Theoretical Spreading (Covering Capacity), min	8 Sq.m/ltr., at 40 microns DFT	IS: 101-93 (Part 8/Sec6)
16.	Fineness of grind (Max)	10 microns	IS : 101-87(Part 3/Sec 5)
*17.	Amine Value of Part B	125-250	As per Appendix-III/ISO 9702
*18.	Hot water resistance	450 hrs @40°C, No blister or loss of adhesion after 24 hrs of recovery period	ASTM D 870 (Test panel as per Table-II)
19.	Humidity Resistance	1000 hrs @ 50°C X RH 95% - No blister or loss of adhesion after 24 hrs of recovery period	ASTM D2247 (Test panel as per Table-II)
20.	Salt spray resistance	500 hrs. Creep age <3 mm, Blister within 3mm of creep age not out of this area.	ASTM B117 (Test panel as per Table-II)
21.	Viscosity (Efflux time by Ford cup No. 4 of paint i.e. mixture of two components at 27± 2°C in Supply condition.	60 sec.max.	IS : 101-89 (Part 1/Sec5)
22.	Fire Properties test	Hazard Level -3 (HL3) – R1/R7/R17	EN 45545-2
23.	% Pigmentation in Base (By Centrifuge Method)	37±2	IS: 101-93 (Part 8/Sec 4) OrASTM D2698

**Table -1 : Technical Requirements For Adhesion Promoting Primer (Two Pack)**

**\* If test to S.No.17 and 18 not found under NABL scope, may be considered from Testing lab accredited as per ISO/IEC-17025.**

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**Details Of Preparing Painted Panels For Testing Adhesion Promoting Primer(Two Pack)**

<b>S. No.</b>	<b>Test</b>	<b>Type of Metal Panel</b>	<b>Size in mm</b>	<b>Painting Detail</b>	<b>DFT</b>	<b>Duration of Air Drying Before Commencement of test (Applicable for panels either air dried or dried at elevated temperature)</b>	<b>Special Instruction</b>
1.	Drying time	S.S. unblasted	150 X 100 X1.25	One coat of Adhesion Promoting Primer	35-40μ	-	No garnet blasting.
2.	Finish	S.S. unblasted	150 X 100 X1.25	One coat of Adhesion Promoting Primer	35-40μ	24 hours	-
3.	Colour	S.S. unblasted	150 X 100 X1.25	One coat of Adhesion Promoting Primer	35-40μ	24 hours	-
4.	Dry film thickness	S.S. unblasted	150 X 100 X1.25	One coat of Adhesion Promoting Primer	35-40μ	24 hours	-
5.	Flexibility	Tinned	150 X 50 X .315	One coat of Adhesion Promoting Primer	35-40μ	7 days	-
6.	Adhesion	S.S.	150 X 50 X .315	One coat of Adhesion Promoting Primer	35-40μ	7 days	Cross cut 1 mm (ASTM D3359-02.) Pull up adhesion as per ASTM D 4541
7.	Resistance to Salt Spray	Un-blasted S.S. and Mild sleet plates	150 X 100 X 1.25	One coat of Adhesion Promoting Primer	Max.40μ	7 days	For 500 hours
8.	Resistance	Un-	150 X 100	One coat	Max.40μ	-	For 1000

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	to Humidity	blasted S.S. and Mild sleet plates	X 1.25	of Adhesion Promoting Primer			hours
9.	Resistance to hot water	Un-blasted S.S. and Mild sleet plates	150 X 100 X 1.25	One coat of Adhesion Promoting Primer	Max.40μ	-	For 450 hours

**Table -2: Details Of Preparing Painted Panels For Testing Adhesion Promoting Primer (Two Pack)**

## 6. Prototype approval:

The firm who has not got their prototype sample approved earlier, shall submit following documents for prototype approval from CDE/RCF for PO placed by RCF or to user railways for PO placed by them respectively, before bulk supply.

The prototype approval is applicable on the first supply of material as per this specification from a supplier. RCF will do prototype approval for POs placed by RCF only.

## 7. Quality Assurance, Tests & Documents:

The following table provides the overview of the system for Quality Assurance Plan, Test & Documents:

<b>Requirement Description</b>	<b>Requirement Detail</b>	<b>Remarks</b>
<b>Quality Assurance plan</b>	<p>The manufacturer shall have the detailed quality assurance plan. The Plan shall be submitted for the approval by RCF/KXH. The QAP document shall clearly document the following and control the test record formats.</p> <ol style="list-style-type: none"> <li>1. control over outsourced products and processes</li> <li>2. Testing of raw material and establishing its traceability</li> <li>3. Sampling Plan</li> <li>4. Type Tests</li> <li>5. Routine Tests</li> <li>6. Acceptance tests</li> <li>7. Raw Materials</li> </ol>	The QAP shall be submitted in PDF soft copy digitally signed by the head of Quality department of the manufacturer for approval.
<b>Type Test</b>	These tests shall be done on a sampled lot of prototype. Such Tests are required only on initial approval, change of design and change of manufacturing process or raw material.	<p>The records of the type tests shall be maintained by the manufacturer and shall be made available upon demand.</p> <p>These records shall be</p>

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	<p><b>These tests are to be repeated after every 36 months or as specified.</b></p> <p>However, if the consignee or inspecting agency desires to do the type tests, before three years, the supplier should not deny the same. There are various circumstances when type tests may be needed on next supply before three years of last supply/last type tests e.g.:</p> <ol style="list-style-type: none"> <li>1) In case of doubt in type test certificate.(previous)</li> <li>2) Complaint regarding type test certificates.</li> <li>3) Failure of material attributable to any of the parameters covered in type tests, etc.</li> </ol> <ul style="list-style-type: none"> <li>• Fire Properties test as per EN45545-2</li> </ul>	traceable and verifiable.
<b>Routine Tests</b>	<p>These tests are required to verify the functional working of the system and shall be repeated after every 12 months.</p> <p>Hot water resistance. HumidityResistance. Salt spray resistance.</p>	<p>The records of the Routine Tests shall be maintained by the manufacturer and shall be made available upon demand.</p> <p>These records shall be traceable and verifiable.</p>
<b>Acceptance tests</b>	<p>These tests shall be done on all or samples of lot for bulk supply. Sampling shall be done as per IS:2500</p> <p>All other parameters except Type Test &amp; RoutineTest above.</p>	<p>The records of the acceptance tests shall be enclosed along with the supply consignment.</p> <p>These records shall be traceable and verifiable.</p>

**Table-3 : Quality Assurance, Tests & Documents**

- 7.1** All the testing shall be conducted by NABL accredited Lab for that particular test. The fireproperties tests as per EN 45545 -2 shall be conducted by either NABL accredited Lab for these testes or Testing lab accredited as per ISO/IEC-17025 to perform/ conduct fire test as per EN45545-2 (Proof of same shall be submitted).

## **8. Marking & Packing**

Each container shall be marked with the legibly marked with indelible marking ink/paint showing the following details:

- a. Name of the material
- b. Source of manufacture
- c. Volume of the material
- d. Batch No. or Lot No. in code or otherwise and
- e. Month& year of manufacture
- f. Shelf life of paint /material on container and temperature to be stored at.

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**9. Information to be provided by bidder / supplier:**

The following information shall be provided by the bidder / supplier.

**9.1 Information to be provided at the time of the bid:**

The following information shall be included with the bid. These documents shall be used to determine suitability for placement of purchase orders.

<b>S. No.</b>	<b>Information to be provided</b>	<b>Important Note</b>
1.	Part No with Brand Name of OEM and Authorisation certificate from OEM (Where the supplier is a authorised dealer of the OEM).	The documents shall contain all details of part No with Brand name of OEM and authorization certificate from OEM. (Where the supplier is a authorised dealer of the OEM).
2.	Technical and safety data-sheet of the offered product.	
3.	Deviation statements with respect to specification; if any.	
4.	All the testing shall be conducted by NABL accredited Lab for that particular test. The fire properties tests as per EN 45545 -2 shall be conducted by either NABL accredited Lab for these testes or Testing lab accredited as per ISO/IEC-17025 to perform/ conduct fire test as per EN45545-2 (Proof of same shall be submitted).	The documents shall be not older than the last 3 years from the date of opening of tender.
5.	The firm shall submit the undertaking that all the test certificates submitted with the offer pertains to the same product being offered.	
6.	ISO9001 / IRIS Certification as available.	

**Table-4 : Information to be provided at the time of the bid**

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## 9.2 Information to be supplied upon release of letter of acceptance / purchase order:

The following information shall be supplied prior to the supply of the ordered material:

<b>S. No.</b>	<b>Information to be provided</b>	<b>Important Note</b>
1.	Copy of the detailed QAP for the Adhesion Promoting Primer ordered.	The document must contain the details as specified in the clause on quality assurance in this specification.
2.	Test Certificates for all tests (as detailed in the QAP) conducted by the manufacturer or third-party agencies.	The test certificates shall be traceable and verifiable.

**Table-5 :Information to be supplied upon release of letter of acceptance / purchase order**

## 9.3 Information to be supplied with the material consignment:

<b>S. No</b>	<b>Information to be provided</b>	<b>Important Note</b>
1.	Copy of the detailed QAP for the Adhesion Promoting Primer ordered.	The document must contain the details as specified in the clause on quality assurance in this specification.
2.	Test Certificates for routine tests (as detailed in the QAP) conducted by the manufacturer or third-party agencies.	The test certificated shall be traceable and verifiable.
3.	Test Certificates for acceptance tests (as detailed in the QAP) conducted by the manufacturer or third-party agencies.	
4.	Certificates / documents establishing compliance and traceability of raw material used for the consignment.	
5.	Complete packing list for the consignment.	

**Table-6:Information to be supplied with the material consignment**

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<b>TECHNICAL SPECIFICATION FOR ADHESION PROMOTING PRIMER</b>			

## APPENDIX – I

### PROCEDURE FOR DETERMINING OF POT LIFE

Take the usable time as the pot life of paint. Condition the components of the coating for one hour at  $27 \pm 2^{\circ}\text{C}$  and mix immediately in proper ratio to get approx. 200 ml. of paint in 250 ml. of container. The lid should be loosely placed on the container.

1. Measure the viscosity initially and every hour thereafter. However, the interval may be shortened, if desired.
2. Near the end of the paint's working life, the viscosity builds-up rapidly. During this period, when it appears the paint 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. The end of the working life is reached when the paint gels, becomes stringy or cannot be thinned for application.



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## APPENDIX- II

### KEEPING PROPERTIES

When stored under cover in a dry place in the original sealed containers under normal temperature conditions, the material shall retained the properties prescribed in the specification for the stipulated period from the date of manufacture which shall be subsequent to the date of placement of contract.

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## APPENDIX-III

### TEST METHOD FOR DETERMINATION OF AMINE VALUE

#### 1. Purpose:

This method determines amine value of Part B of APP primer using potentiometric titration.

#### 2. Safety Precautions:

Proper personal protective equipment should be worn during transfer of materials so that injury due to spillage is avoided. 2. Review MSDS for each material before handling.

#### 3. Reagents:

1. Bromophenol Blue Indicator
2. Isopropanol/DI Water Solution-80/20 by volume
3. 0.5N HCl aqueous solution.

#### 4. Apparatus:

1. Potentiometric Titrator
2. Combined glass pH electrode (Metrohm # 6.0262.100)

#### 5. Procedure:

1. Weigh 3.5 - 4.5 grams to the nearest 0.1 mg into a 250 ml beaker.
2. Add 110 mls of 80/20 IPA/DI Water Solution and 4-6 drops of BromophenolBlueIndicator.
3. Titrate to the potentiometric or visual (yellow) endpoint with 0.5N HCl.

#### 6. CALCULATION:-

$$\% \text{ Free Amine (as DEA)} = \frac{\text{Normality of HCL} \times \text{ml of HCL required} \times 56.1}{\text{Sample wt (g)} \times 10}$$

---X---X---X---