



TÜVRheinland®

**Corrosion Management Program
Technical Specification of Paint Coating**

For

**Deepak Fertilizers and Petrochemicals
Corporation Limited**

Plot K1, MIDC Industrial Area, Taloja, Raigad-410028, Maharashtra,
India



**DEEPAK FERTILISERS
AND PETROCHEMICALS
CORPORATION LIMITED**

 <p>DEEPAK FERTILISERS AND PETROCHEMICALS CORPORATION LIMITED</p>	<p>TECHNICAL SPECIFICATION OF PAINT COATING</p>	 <p>TÜVRheinland® Precisely Right.</p>
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ABBREVIATION

Abbreviations	
API	American Petroleum Institute
CS	Carbon Steel
CUI	Corrosion Under Insulation
DFPCL	Deepak Fertilizers and Petrochemicals Corporation Limited
DFT	Dry Film Thickness
HSD	High Speed Diesel
H ₂ SO ₄	Sulfuric Acid
IC	Intermediate Coat
IS	Indian Standard
ISO	International Organization for Standardization
IOZ	Inorganic Zinc
LTCS	Low Temperature Carbon Steel
MIO	Micaceous Iron Oxide
MSDS	Material Safety Data Sheet
NACE	National Association of Corrosion Engineers
PC	Primer Coat
PDS	Product Data Sheet
Ri	Degree of Rusting
Sa 1	Light Blast Cleaning
Sa 2	Thorough Blast Cleaning
Sa 2 1/2	Very Thorough Blast Cleaning
Sa 3	Blast Cleaning to White Metal
SSPC	The Society for Protective Coatings
SS	Stainless Steel
St2	Thorough scraping (with hard-metal scraper) and wire brushing – disc-sanding – etc.
St3	Extremely thorough scraping and wire brushing, disc sanding, power brushing



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Abbreviations

	etc.
TC	Top Coat
TUVR	TUV Rheinland (India) Pvt. Ltd.

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1 SCOPE AND INTRODUCTION

This specification is applicable to general requirements of painting / coating within Deepak Fertilizers and Petrochemicals Corporation Ltd. (DFPCL), Talaja. These requirements must be fulfilled and complied for painting and coating of all equipment, pipelines, and storage tanks when they are off stream / shutdown and new fabrication. However, on specific situational based recommendation from area inspection engineer, painting may be carried out with certain cautious deviations from these requirements such as painting without stipulated surface preparation. Painting includes surface preparation, clean up and application of painting. As a part of the periodical review of the specification, it has been reviewed the existing practices vis-a vis current industrial practices and available products with reputed painting manufacturers for enhancing effectiveness and durability of the painting systems.

Accordingly, painting specification has been prepared for implementation at DFPCL – K1 Complex, Talaja. Scope of work covered in this specification includes, but not limited to the following:

- Surface preparation methods
- Selection and application of painting on:
 - a) Equipment including high temperature surfaces
 - b) Piping
 - c) Steel Structures, buildings
 - d) Storage Tanks
 - e) High temperature surfaces (Furnace casings, Stacks etc.)

1.1 Codes & Standards

Following relevant international standards were considered for surface preparation;

- a) Swedish Standards
- b) The Society for Protective Coatings (SSPC)
- c) NACE Standards
- d) ISO 4624, ISO 2802



SN	Standard	Description
01	ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
02	ASTM D1200	Standard Test Method for Viscosity by Ford Viscosity Cup
03	ASTM D1475	Standard Test Method for Density of Liquid Coatings, Inks and Related Products
04	ASTM D2247	Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
05	ASTM D2369	Standard Test Method for Volatile Content of Coatings
06	ASTM D2697	Standard Test Method for Volume Non-Volatile Matter in Clear or Pigmented Coatings
08	ASTM D4417	Standard Test Method for Field Measurement of Surface Profile of Blast Cleaned Steel
10	ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
11	ASTM D6677	Standard Test Method for Evaluating Adhesion by Knife
12	ISO 2802	Determination of Film Thickness
13	ISO 4624	Pull-Off Test for Adhesion
14	ISO 4628-1	Paint & Varnishes – General Introduction and Designation System
15	ISO 4628-2	Paint & Varnishes - Assessment of Degree of Blistering
16	ISO 4628-3	Paint & Varnishes – Assessment of Degree of Rusting
17	ISO 4628-4	Paint & Varnishes - Assessment of Degree of Cracking
18	ISO 4628-5	Paint & Varnishes – Assessment of Degree of Flaking
19	ISO 4628-6	Paint & Varnishes – Rating of Degree of Chalking
20	ISO 8501-1	Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings
21	ISO 8501-2	Preparation grades of previously coated steel substrates after localized removal of previous coatings
22	ISO 8501-3	Preparation grades of welds, cut edges and other areas with surface imperfections
23	ISO 8501-9	Field method for the conductometric determination of water-soluble salts
24	NACE No. 1 / SSPC-SP 5 / Sa 3	White Metal Blast Cleaning



SN	Standard	Description
25	NACE No. 2 / SSPC-SP 10 / Sa 2 1/2	Near - White Metal Blast Cleaning
26	NACE No. 4 / SSPC-SP 7 / Sa 1	Brush-Off Blast Cleaning
27	NACE RP 0188	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
28	SSPC-PA 2	Procedure for Determining Conformance to Dry Coating Thickness Requirements
29	SSPC-QP1	Application, Instructions, and Program Rules - Standard Procedure for Evaluating Painting Contractor (Field Application to Complex Industrial Structures)
30	SSPC-SP 1	Solvent Cleaning
31	SSPC-SP 2	Hand Tool Cleaning
32	SSPC-SP 3	Power Tool Cleaning
33	SSPC-SP 6	Commercial Blast Cleaning
34	SSPC-SP 8	Pickling
35	SSPC-VIS 1	Guide for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
36	SSPC-VIS 3	Guide for Steel Surfaces Prepared by Power and Hand Tool Cleaning

The paint manufacturer's instructions shall be followed as far as practicable at all times. Particular attention shall be paid to the following:

- a) Instructions for storage (Shelf life)
- b) Surface preparation prior to painting
- c) Mixing and thinning
- d) Application of paints and recommended limit on time intervals between coats



2 SURFACE PREPARATION METHODS

Most metallic articles that are subjected to re-coating are heavily contaminated and require, thorough cleaning and pre-treatment before the coating is applied. Surface preparation is the most critical step in the coating process and it decides the life of coating.

Surface contamination in the form of rust, scale, oil grease and dirt must be removed before painting. Invisible contamination may also be present and represents, on the whole, a greater hazard. Examples of the latter are soldering fluxes, perspiration in the form of hand marks, chlorides from marine atmosphere and sulfite from industrial atmosphere.

The following Table-1 gives surface preparation specification in the descending order.

Table 1 Surface Preparation in Descending Order of Effectiveness

SN	Method of Cleaning	Specification
01	White metal blast	NACE#1, SSPC SP 5, Sa 3
02	Near-white metal blast	NACE#2, SSPC SP 10, Sa 2 1/2
03	Acid Pickling	SSPC SP 8
04	Brush Blast	NACE#4, SSPC SP 7, Sa 1
05	Flame Clean and Power Sanding	SSPC SP 4
06	Power Tool Cleaning	SSPC SP 3
07	Cheap and Hand Wire Brush	SSPC SP 2
08	Solvent Wipe	SSPC SP 1

Note: Blasting if necessary is usually carried out using steel balls or Cu slag (Cu slag grading: **a.** 0.2 to 2.4 mm - coarse sieve for paint & rust removal. **b.** 0.4 to 1.5 mm - for general new surfaces.

2.1 Inspection of Blasted Steel Surface

For the purpose of inspecting the blasted steel surface with cu slag abrasive, the respective “**Visual standards**” can be utilized;

a) White metal blast (SSPC 5, NACE No. 1, and Sa 3)

This is defined as removing all rust, scale, paint etc. to a clean white metal which has a uniform Grey white appearance. Streaks and stains of rust or other contaminants are not allowed.

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b) Near white metal (SSPC 10, NACE No. 2, Sa 2 1/2)

This provides a surface of about 95% as clean as white metal. Light shades and streaks are not allowed.

c) Commercial blast (SSPC 6, NACE No. 3, Sa 2)

This type of blast is more difficult to describe. It essentially amounts to about 2/3 of a white metal blast, which allows for very slight residues of rust and paint in the form of staining.

d) Brush of blast (SSPC 7, NACE No. 4, Sa 1)

This preparation calls for removal of loose rust, paint, scales, etc. Tightly adherent paint, rust and scale is permitted to remain.

2.2 Pictorial Standards

During surface preparation operations, the surface condition obtained has to be compared with pictorial standards available for getting the specified condition.

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3 PAINT APPLICATION

The purpose of painting/coating application is to develop a continuous highly adherent film with an even thickness over the substrate. To achieve this, various factors have to be considered such as type of coatings and weather conditions, application methods etc.

3.1 Application Restrictions

For all cases, paint manufacturer guidelines shall be followed. Following restrictions are given as recommended practices;

- a) Coating application shall not be permitted during fog, mist or rain.
- b) Coating application shall not be permitted when the relative humidity is 85 percent or above.
- c) Coating application shall not be permitted when the steel surface temperature and/or ambient temperature is below 10°C.
- d) Coating application shall not be permitted when the steel surface temperature above 50°C.
- e) Coating application shall not be permitted when the steel surface temperature is less than 3°C (above the dew point).
- f) Humidity and dew point readings shall be taken by contractor with a sling Psychrometric meter and calculated using psychrometric tables. Readings shall be taken prior to coating operations commencing and at least every four hours while coating application is ongoing.
- g) Coatings shall not be applied before the surface has been inspected and the preparatory work approved.
- h) All sharp projections shall be ground to min. 2 mm radius and a thick stripe coat shall be applied at sharp edges.
- i) Fresh water blasting or fresh water mopping shall be carried out on Salt water spray areas before application of primer to remove the salts deposited on metal surface. Mopping can be repeated before application of other coats to remove salts deposited on previous coats, if such deposits are suspected. The permissible Chloride content for water used shall be 50 ppm maximum

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4 INSPECTION AND TESTING OF PAINTING MATERIAL

4.1 Paint Inspection Requirements

- a) Painting Contractor shall procure the paints from the approved manufacturers after fully satisfied with their technical specification preferably tested by a 3rd Party NABL approved laboratory.

Below is the list of painting manufacturers, subject to approval of DFPCL;

- Akzo Nobel Paints
- Asian Paints PPG Ltd
- Berger Paints Ltd
- CDC Carboline Ltd
- Goodlass Nerolac Paints Ltd
- Growel India (old - Bombay Paints)
- Hempel Paints
- Jotun Coatings
- Kirloskar Corrocoats
- PPG Ind USA (Sigma Coatings & Amercoat)
- Shalimar Paints Ltd.
- Dooall Corporation Ltd.

All the procured paint material along with batch/test certificates shall be offered for DFPCL inspection for approval. Remaining Shelf life shall be at least 90% of the total duration.

- b) All paint materials shall be accompanied by Manufacturer Test Certificates.
- c) Minimum suggested stages of inspection shall be;
- Surface Preparation
 - Primer application
 - Each coat of paint



- d) All defects noticed during stages of inspection, shall be rectified free of cost by the contractor. All records shall be kept by the contractor.
- e) To avoid rework it is preferable to take wet film thickness measurements during painting in order to ascertain the adequacy and uniformity of thickness.
- f) Dry film thickness shall be taken on each coat after drying and curing of the coat. Dry film thickness (DFT) readings shall be taken using a non-destructive dry film thickness instrument capable of storing the readings. A minimum of 5 (max 10) readings shall be taken covering each coat prior to application of the following coat to ensure the correct required DFT.
- g) DFT meter used shall be calibrated before each inspection and shall be witnessed by the Inspector.
- h) Frequency of inspection and criteria for acceptance of painting work shall be in accordance with the following Table-2:

Table 2 Frequency of Inspection and Acceptance Criteria

SN	Test	Standard	Frequency	Acceptance Criteria
01	Surface Cleanliness	ISO 8501-1	One per ten (10) square meters	Sa 2 1/2
02	Surface Profile	ISO 8503-2	One per ten (10) square meters	As per coating procedure / data sheet
03	Total Soluble Salt Contamination	ISO 8502-9	One per twenty (20) square meters or minimum 5 tests whichever is more	<5 ug/cm ²
04	Dust	ISO 8502-3	One per ten (10) square meters	Rating 2 or better
05	Adhesion	ISO 4624	One pretest panel, per shift	5 MPa
06	Holiday Detection	NACE RP0188	100% of surface	Zero defects
07	Dry Film Thickness	SSPC PA-2	As per Annexure II	Shall not be less than 80 % and more than 120 % of Specified dry film thickness (DFT).
08	Wet Film Thickness	ISO 2802	One per ten (10) square meters	Consistent with providing required DFT

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- i) Each contractor shall deploy adequate number of NACE CIP Level 1 qualified coating inspectors to monitor and inspect the surface preparation, storage, handling, mixing and application on substrate of the painting/coating and to ensure the compliance of this specification. The Inspection test plan which will be mandatory part of the contract shall be prepared by the above qualified inspector and get approved by DFPCL. The CONTRACTOR's qualified coating inspector and DFPCL shall sign an inspection report as per approved inspection test plan.

The report shall consist, as a minimum, of the following in addition to the inspection parameters and acceptable criteria as above Table-2.

- Names of the APPLICATOR and the responsible personnel
 - Dates when work was carried out
 - Equipment and techniques used
 - Type and calibration of instruments used
 - Weather and ambient conditions
- j) Each contractor shall possess relevant standards and deploy all inspection tool / instrument to carry out the all above inspection and testing as per relevant standard.
- k) For coating different color shades to be used for primer and intermediate coats, for ease in monitoring & identification of number of coats.
- l) Following requirements shall be checked before deployment of painting inspector;
- Formalized training & Certification of the inspector
 - Experience in the type of structure to be inspected
 - Availability of inspection equipment to the inspector
 - Records of all inspection equipment used by inspector
 - Standards & Procedures to show conformance with the specifications available with the inspector
 - Approved copies of materials supplier technical data sheets, application instructions and material safety
- m) Daily inspection report shall contain the following;
- Weather and site condition



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- Pre-surface condition & cleanliness
- Surface Preparation monitoring
- Post surface preparation cleanliness and profile
- Painting material preparation & application
- Physical film properties, DFT measurement
- Verification of corrective actions prior to final approval
- Record of equipment used for measurement

FORM 4

DAILY COATING INSPECTION REPORT				DATE: M T W R F S S U #	Pg of
PROJECT/CLIENT:				PROJECT#:	COPY Office Client Proj Mgr
LOCATION:				INSPECTOR:	
DESCRIPTION:				ATTACHMENTS DFT SHEET NCR/CAR	
REQUIREMENTS:					
CONTRACTOR:			SPEC#:	REVISION#:	
DESCRIPTION OF AREAS & WORK PERFORMED				HOLD POINT INSPECTIONS PERFORMED	
				1. WEATHER AND SITE CONDITIONS 2. PRE SURFACE PREPARATION/CONDITION & CLEANLINESS 3. SURFACE PREPARATION MONITORING 4. POST SURFACE PREPARATION/CLEANLINESS & PROFILE 5. APPLICATION MONITORING/WET FILM THICKNESS (WFT) 6. POST APPLICATION/APPLICATION DEFECTS 7. POST CURE/DRY FILM THICKNESS (DFT) 8. CORRECTIVE ACTIONS FOLLOW UP & FINAL INSPECTION APPROVED BY:	
SURFACE CONDITIONS				AMBIENT CONDITIONS	
NEW MAINT PRIMER/PAINT AGE/DRY/CURE STEEL GALVANIZE CONCRETE HAZARD SAMPLE REPORT # DEGREE OF CONTAMINATION: TEST: Cl $\mu\text{g}/\text{cm}^2/\text{ppm}$ Fe ppm pH ppm DEGREE OF CORROSION: SCALE PITTING/HOLES CREVICES SHARP EDGES WELD MOISTURE OILS PAINTED SURFACE CONDITION: DRY TO/TOUCH HANDLE RECOAT DRY/OVERSPRAY RUNS/SAGS PINHOLES HOLIDAYS ABRASION FALL OUT				AREAS: TIME DRY BULB TEMP° C/F ° ° ° ° WET BULB TEMP° C/F ° ° ° ° % RELATIVE HUMIDITY % % % % SURF TEMP° C/F MIN/MAX / ° / ° / ° / ° DEW POINT TEMP° C/F ° ° ° ° WIND DIRECTION/SPEED WEATHER CONDITIONS:	
SURFACE PREPARATION				APPLICATION	
START TIME	FINISH TIME	AREA	ft ² /m ²	START TIME	FINISH TIME AREA ft ² /m ²
SOLVENT CLEAN HAND TOOL POWER TOOL			PRIMER INTERMEDIATE TOPCOAT TOUCH UP		
HP WASH PSI			GENERIC TYPE QTY MIXED		
ABRASIVE BLAST ABRASIVE TYPE SAMPLE			MANUF MIX RATIO		
BLAST HOSE SIZE NOZZLE SIZE/PSI			PROD NAME MIX METHOD		
AIR SUPPLY CFM AIR SUPPLY CLEANLINESS			PROD # STRAIN/SCREEN		
WATER/OIL TRAP CHECK EQUIPMENT CONDITION CHECK			COLOR MATERIAL TEMP		
			KIT SIZE/COND INDUCTION TIME		
SURFACE CLEANLINESS & PROFILE MEASUREMENT				SHELF LIFE POT LIFE	
JOB SPEC NACE/SSPC-SP-				BATCH NUMBERS REDUCER #	
NACE/SSPC SPEC/ VISUAL STDS				(A) QTY ADDED	
PROFILE CHECK: DISC TAPE GAUGE				(B) % BY VOLUME %	
SPECIFIED mils/ μm ACHIEVED mils/ μm				(C) Specified WFT mils/ μm	
SURFACE EFFECT ON D.F.T. GAUGE/BMR/ mils/ μm				REDUCER Acheived WFT mils/ μm	
MEASUREMENTS				AIRLESS/CONV BRUSH ROLLER PRIMER	
				PUMP/POT HOSE dia. AIR CHECK	
				RATIO/SIZE HOSE Lng. TRAP	
				GPM/CFM SPRAY GUN FILTER	
				PSI TIP SIZE AGITATOR	
D.F.T. GAUGE CALIBRATION				INSPECTOR'S SIGNATURE DATE	
GAUGE TYPE MODEL	GAUGE SERIAL #	GAUGE CALIB VERIFIED	SPECIFIED AVERAGE D.F.T.	AVERAGE D.F.T THIS COAT	TOTAL AVERAGE D.F.T

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4.2 Painting Contractor Evaluation

Painting contractor evaluation shall be done as per the SSPC-QP1 requirements.

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5 FREQUENCY AND GUARANTEE

Painting system frequency & guarantee except crude oil tank shall be AS follows:

- a) For surfaces painted after Blasting as surface preparation, 5 years
- b) For surfaces painted after Manual Cleaning as surface preparation, 4 years
- c) Guarantee period shall be same as frequency
- d) Paint material shall be procured from approved manufacturers who also will stand guarantee as above clause.

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6 AREA CLASSIFICATION AND RECOMMENDED PAINTING SCHEMES

6.1 Painting Systems Using Cu-Slag Blasting to Sa 2.5 (Min. Profile 50 microns) as Surface Preparation

SYSTEM 1: For External Surface of Vessel, Equipment / Column / Piping, and all Structural upto 100 Deg C temperature. (Exposed to Sunlight, open Environment)

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC1	Inorganic zinc (IOZ) silicate primer	1 x 75	Brush / Airless
IC1	2K Epoxy coating with polyamide as hardener	2 x 50	Brush / Airless
TC1	Aliphatic acrylic modified high solids weather resistant recoatable two pack polyurethane (finish coat)	1 x 50	Brush / Airless

Notes:

- IOZ - Inorganic Zinc silicate Primer.
- Such system is good for a life of 8-10 years in an external C3 environment.
- In case the environment is industrial with lots of SO₂, H₂S and CO₂ emissions, the coating thickness of First coat to be changed to 2 x 100 microns.

SYSTEM 2: For External Surface of Vessel, Equipment / Column / Piping, and all Structural upto 100 Deg C temperature. (Covered / Under Shed)

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC1	Inorganic zinc (IOZ) silicate primer	1 x 75	Brush / Airless
IC1	2K Epoxy coating with polyamide as hardener	2 x 50	Brush / Airless

Notes:

- Such system is good for a life of 8-10 years in an external C3 environment.
- In case the environment is industrial with lots of SO₂, H₂S and CO₂ emissions, the coating thickness of First coat to be changed to 2 x 100 microns.



SYSTEM 3: Cooling Tower Area (Salt Water Spray Area) – Where Blasting is Possible

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC1	Inorganic zinc (IOZ) silicate primer	1 x 65	Brush / Airless
IC2	Low VOC (Volatile Organic Compounds) two components internally flexibilised high build surface tolerant epoxy pigmented with Aluminum & Lamellar Micaceous Iron oxide coating	2 x 120	Brush / Airless
TC1	Aliphatic acrylic modified high solids weather resistant recoatable two pack polyurethane (finish coat)	1 x 40	Brush / Airless

Note: Salt water spray areas will require fresh water blasting or fresh water (Max. Chloride content 50 ppm) mopping shall be carried out on Salt Water spray areas, before application of primer, to remove the salts deposited on metal surface. Mopping can be repeated before application of other coats to remove salts deposited on previous coats, if such deposits are suspected.

SYSTEM 4: For Insulated Equipment / Vessel / Column / Piping from 200 Deg C to 550 Deg C temperature

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC1	Inorganic zinc (IOZ) silicate primer	1 x 75	Brush / Airless



Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
IC3	Aluminum (Upto 200 Deg C)	2 x 100	Brush / Airless
IC4	Aluminum Silicon (Upto 400 Deg C)	2 x 100	Brush / Airless
IC5	Polysiloxane (From 450 Deg C to 550 Deg C)	2 x 100	Brush / Airless

6.2 Painting Systems Using Manual Cleaning to St2 or Power Tool Cleaning to St3 as Surface Preparation

SYSTEM 5: For External Surface of Vessel, Equipment / Column / Piping, and all Structural upto 100 Deg C temperature (Exposed to Sunlight, Open Environment)

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC2	Surface Tolerant Coating (Epoxy Mastic)	1 x 80	Brush /Airless
IC1	2K Epoxy coating with polyamide as hardener	2 x 50	Brush /Airless
TC1	Aliphatic acrylic modified high solids weather resistant recoatable two pack polyurethane (finish coat)	1 x 50	Brush /Airless

Note: Such system is good for life of 8-10 years in C3 environment

SYSTEM 6: For External Surface of Vessel, Equipment / Column / Piping, and all Structural upto 100 Deg C temperature (Covered Area / Under Shed)

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC2	Surface Tolerant Coating (Epoxy Mastic)	1 x 80	Brush /Airless
IC1	2K Epoxy coating with polyamide as hardener	2 x 50	Brush /Airless

SYSTEM 7: For External Surface of Vessel, Equipment / Column / Piping, and all Structural with SO₂, H₂S, NH₃ and/or CO₂ emission upto 100 Deg C temperature (Exposed to Sunlight, Open Environment)

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
------------	-----------------------	--------------	-----------------------



Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC2	Surface Tolerant Coating (Epoxy Mastic)	1 x 80	Brush /Airless
IC6	Nano modified 2K Epoxy coating with polyamide as hardener	2 x 75	Brush /Airless
TC1	Aliphatic acrylic modified high solids weather resistant recoatable two pack polyurethane (finish coat)	1 x 50	Brush /Airless

SYSTEM 8: For External Surface of Vessel, Equipment / Column / Piping, and all Structural with SO₂, H₂S, NH₃ and/or CO₂ emission upto 100 Deg C temperature (Covered Area / Under Shed)

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC2	Surface Tolerant Coating (Epoxy Mastic)	1 x 80	Brush /Airless
IC6	Nano modified 2K Epoxy coating with polyamide as hardener	2 x 75	Brush /Airless

SYSTEM 9: Cooling Tower Area (Salt Water Spray Area)

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC1	Inorganic zinc (IOZ) silicate primer	1 x 65	Brush / Airless
IC6	Nano modified 2K Epoxy coating with polyamide as hardener	2 x 75	Brush /Airless
TC1	Aliphatic acrylic modified high solids weather resistant recoatable two pack polyurethane (finish coat)	1 x 40	Brush / Airless

SYSTEM 10: Utility Coal Fired

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC1	Surface Tolerant Coating (Epoxy Mastic)	1 x 100	Brush / Airless
IC6	DL-AR (nano modified epoxy coating which has resistant to all acids in dip as well as in exposed condition)	2 x 100	Brush /Airless



Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
TC1	Aliphatic acrylic modified high solids weather resistant recoatable two pack polyurethane (finish coat)	1 x 50	Brush / Airless

6.3 Other Painting Systems

SYSTEM 11: For GI Surfaces (Excluding Galvanized Thickness)

Paint Type	Generic Name of Paint	DFT (Micron)	Method of Application
PC2	Etch Primer - 1 Coat	--	Brush / Airless
IC1	2K Epoxy coating with polyamide as hardener	1 x 100	Brush / Airless
TC1	Aliphatic acrylic modified high solids weather resistant recoatable two pack polyurethane (finish coat)	1 x 40	Brush / Airless

Note: Surface preparation is only cleaning of dust / oil contamination

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7 DETAILED PAINT SPECIFICATION

7.1 List of Primers and Finish Paints

For all internal lining / internal painting works, manufacturer's laboratory test statement / Laboratory Paint performance certificates to be submitted by paint manufacturers & checked apart from material test certificates for specified services at operating temperature and condition. Material shall be procured from only those approved manufacturers who will meet the above stated criteria.

Table 2 List of Primers and Finish Paints

SN	Primer	Paint Type
1	Inorganic Zinc ethyl silicate primer (Minimum 85% Zinc dust by weight in the dried film)	PC1
2	Surface Tolerant Coating (Epoxy Mastic)	PC2
	Finish Paints	
3	High build two pack polyamide cured epoxy	IC1
4	Low VOC High build Surface tolerant Epoxy pigmented with Al, Micaceous iron oxide	IC2
5	Aluminum	IC3
6	Aluminum Silicon	IC4
7	Polysiloxane	IC5
8	Nano modified 2K Epoxy coating with polyamide	IC6
	Polyurethane Paints	
9	Acrylic Aliphatic weather resistant recoatable polyurethane paint	TC1

7.2 Paint Specifications - Product Data Sheet (PDS)

Each manufacturer / supplier of the paint must submit the Product Data Sheet (PDS) which should include all required data (% volume solid, viscosity, density, coverage etc.) and the test data for mechanical, chemical and weathering parameters. It should also mention the surface preparation conditions, drying time, recoating intervals and the curing duration. Wherever required, it must mention the temperature stability and the maximum temperature it can sustain.



8 PAINTING INSPECTION INSTRUMENTS

Table 3 Ideal Painting Inspection Instruments

SN	Instrument Name	Purpose
01	Surface Temperature Thermometer	Measurement of surface temperatures
02	Psychrometric Charts	Determining relative humidity (%) and dew point temperature
03	Chloride Indicator Strips / Tubes or Kits	Extracting and analyzing surface chloride concentrations
04	Conductivity Meter	Measuring the conductivity of abrasive or surface soluble salts
05	Comparator Discs	Measurement of surface profile (ASTM D4417, method A)
06	Depth Micrometer	Measurement of surface profile (ASTM D4417, method B)
07	Replica Tape and Spring Micrometer	Measurement of surface profile (ASTM D4417, method C)
08	Hypodermic Needle Pressure Gauge	Measuring blast nozzle pressure
09	Blast Nozzle Orifice Gauge	Measuring blast nozzle wear
10	SSPC VIS 1	Assessing surface cleanliness after dry abrasive blast cleaning
11	SSPC VIS 3	Assessing surface cleanliness after hand/power tool cleaning
12	Wet Film Thickness Gauge	Measuring the applied wet thickness of paint
13	Dry Film Thickness Gauge	Measuring the applied dry thickness of paint
14	Low Voltage Pinhole Detector	Locating pinholes and holidays (misses) in coating systems

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9 LABORATORY TESTING

Laboratory testing of all the paint materials supplied for the project should be carried out to meet the TDS requirement of the paint. This is basically divided into two parts;

Characterization of Paints which consists of four tests

- Total Non-Volatile Material (NVM) as per ASTM D2369
- Percentage volume solid as per ASTM D2697
- Viscosity as per ASTM D1200
- Density as per ASTM D1475

These four tests should be carried for each batch which will help in confirming the uniformity of the supplied paint.

In addition, certain long-term tests are required which should be done only once to ascertain the quality and durability of the coating.

- Salt Spray Test as per ASTM B117
- Humidity Test as per ASTM D2247
- Pull-off Adhesion as per ASTM B4541

The number and types of tests that can be conducted in the laboratory are almost limitless. Because field testing of coatings is so costly in time, labor, and facilities, it has been the persistent aim of formulators, raw-material producers, and users of coatings to establish meaningful accelerated tests.

The tests can define certain characteristics of a painting system. This discrimination usually is specific to the type of accelerated test and frequently does not indicate in advance how a given painting will perform in service. However, the tests are invaluable when developing coating or appraising new concepts in painting application or use.

9.1 General Immersion Tests

General Immersion Test can be as simple as standard saltwater immersion test for painting to be used in the atmosphere or as complicated as cold wall effect immersion test for heavy painting to be used constantly in immersion service. Reproduce the anticipated conditions of the field exposure as closely as possible when evaluating painting for immersion service.

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9.2 Salt-Spray Testing

Exposure of painting to various formulations of Salt Spray or fog with and without cyclic immersion and exposure to highly actinic light, heat, and various wetting and drying cycle is a common practice.



9.3 Impedance Measurements

Various approaches to the measurement of changes in the electrical resistance of a painting during exposure are available.

9.4 Condensation Apparatus

Relying on the known susceptibility of coating to permeation by condensed water, a screening test is available in a laboratory type cabinet that results in condensation of water on the painted surface. Disbonding of poorer painting occurs.

9.5 Environmental Test Rooms

Environmental test Rooms that permit various combination of temperature, fogging, humidity levels, and shower effects to simulate rain can reproduce in an accelerated more many of the factors present in an actual exposure.

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10 MAINTENANCE OF PAINTING SYSTEMS

In general, periodic inspection of painting system shall be performed in **every 6 months** to understand the effectiveness of the applied paint and to regularize the maintenance activities for the painting systems.

The implementation of a maintenance painting option for a painting remedial work should be in accordance with DFPCL policy related to the activities which are undertaken to preserve the integrity or the functionality of structures, process system and equipment.

After the data collected during the inspection of the structures or components are reviewed, the different categories of maintenance operation should be defined.

Based on the requirements reported in this Specification, the categories of maintenance operations listed in the following items may be performed.

The different maintenance painting options are identified as follows:

a) **Refurbishment:**

- i. Spot Repair
- ii. Spot Repair and Full Topcoat

b) **Renovation**

- i. Renovation and complete recoat

For interpretation of the requirements listed for each maintenance painting option governed by this Specification, the following definitions related to the rust distribution have been used:

- a) **Spot Rusting:** Spot rust occurs when the rust formation is concentrated in a few localized areas of the coated surfaces under examination.
- b) **General Rusting:** General rusting occurs when various size of rust spots is randomly distributed across the surfaces under examination.
- c) **Pin-point Rusting:** Pin-pointing rusting occurs when the rust is distributed across the surfaces under examination as very small individual spot of rust.

10.1 Refurbishment

a) **Spot Repair**

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The spot repair has to be considered refurbishments operation namely repairs of the existing coating, performed by surface preparation and touch-up of localized areas of deteriorated coating and corrosion.

As guideline the spot repair should be considered if the extension of the spot rusting or deteriorated coating is less than 3% localized or when the general rusting, randomly distributed across the surface, is up to rust grade Ri2 (0.5%) in accordance with ISO 4628-3.

This type of maintenance painting option shall not be selected if the pattern of the rust is pin-point rusting type, distributed across the surface. Any degree of pin-point rusting shall require renovation as described below;

The presence of other defects such as blistering, cracking, flaking and chalking shall be rated respectively according to ISO 4628-2, ISO 4628-4, ISO 4628-5 and ISO 4628-6. The degree of these defects shall be rated in addition to the rust grade and taking into consideration for the selection of the maintenance painting option intended to be performed. As general guide spot repair should be considered as well in the following circumstances:

- i. The zone and / or areas of the structures to be repaired are hidden or in low-visibility area and thus unimportant to the aesthetics.
- ii. Structures are small, not requiring extensive scaffolding or difficult-to-reach areas

b) Spot Repair and Full Topcoat

The spot repair and full topcoat involves spot repairs of deteriorated coating and corroded areas followed by the application of a topcoat over the entire surfaces, including spot repair areas and intact coating areas.

Spot repair and recoating should be considered if the extension of the spot rusting or deteriorated coating is less than 8% localized or when the general rusting, randomly distributed across the surface is greater than Ri2 (0.5%) and up to rust grade Ri4 (8%) in accordance with standard ISO 4628-3.

This type of maintenance shall not be selected if the pattern is of the pin-pointing rusting type distributed across the surface. Any degree of pinpoint rust shall require renovation as described below;

The presence of other defects such as blistering, cracking, flaking and chalking shall be rated respectively according to ISO 4628-2, 4628-4, ISO 4628-5 and ISO 4628-6. The

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degree of these defects shall be rated in addition to the rust grade and taking into consideration for the selection of the type of maintenance intended to be performed.

This maintenance painting option should often delay the need to remove the complete existing and intact painting. Spot Repair and Full Topcoat may be considered under the following circumstances:

- i. The intact surfaces of the structures and components intended to be recoated can be easily cleaned, degreased and ready to be top coated.
- ii. Adequate evaluation of over coating risk and assessment of the adhesion of the existing coating.

c) Renovation and Complete Recoat

This type of maintenance shall be performed on the entire surfaces of the components or on extensive localized areas. The renovation operation involves removing the complete existing coating and of all corrosion products followed by the application of the original paint system applied during construction provided by the applicable painting systems listed in this specification.

Renovation should be considered if the extension of the rust areas or deteriorated coating is higher than those described under spot repair and recoating namely spot rusting greater than 8% or general rusting greater than Ri4 (8%) in accordance with ISO 4628-3, including all surfaces affected by pin-pointing rusting type, distributed at any rate across the surface.

As guide, the renovation and complete recoat may be considered as well in the following circumstances:

- i. The overall coating conditions of the structures or components are poor due to the presence of extensive rusted and damaged areas.
- ii. When the remaining life of the structures or component justifies this type of maintenance.

10.2 Criteria for Maintenance Painting in Atmospheric Service

Criteria for application of different types of maintenance painting shall confirm to Table 4 for atmospheric service.

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Table 4 Recommended Maintenance Painting System Options

Options	Rust Distribution Type and Adhesion		
	Spot Rusting	General Rusting	Adhesion
Refurbishment			
Spot Repairs	< 3%	≤ Ri2	Not Required
Spot Repairs and Full Top Coat	$3 \leq \% \leq 8$	$2 \leq Ri \leq 3$	> 2 MPa (300 psig / 20.68 barg) by pull off test as per ASTM D4541 Or > 2 (knife test) as per ASTM D6677
Renovation			
Renovation and Complete Recoat	≥ 8%	> Ri3	Not Required

Corrective actions report shall be maintained as indicated below;

FORM 6

CORRECTIVE ACTIONS REPORT		DATE:	M T W T F S S U	#	Pg of
		PROJECT#:		COPY	
		INSPECTOR:		QC Mgr Client	
PROJECT/CLIENT:				Proj Mgr	
LOCATION:				ATTACHMENTS	
DESCRIPTION:				STOP WORK ORDER	
REQUIREMENTS:					
CONTRACTOR:		SPEC#:		REVISION#:	
TIME & LOCATION		NAME/COMPANY/TITLE			
DESCRIPTION OF NONCONFORMING ITEM		DESCRIPTION OF NONCONFORMANCE			
REFERENCED: SPECIFICATION/PROCEDURE/STANDARD		ACTION LEVEL			
DISCUSSION & RECOMMENDATIONS					
APPROVAL & CORRECTIVE ACTIONS					
CORRECTIVE ACTIONS FOLLOW UP					
FINAL APPROVAL:					
SIGNATURE	TITLE	DATE	INSPECTOR'S SIGNATURE	DATE	



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Photographic evidence of the defect shall be maintained as indicated below;

FORM 7

PHOTOGRAPH RECORD				DATE:	M	T	W	R	F	S	SU	#	Pg	of
				PROJECT#:	COPY									
PROJECT/CLIENT:													QC Mgr	Client
LOCATION:													Proj Mgr	_____
CAMERA TIME/DATE VERIFIED: YES NO N/A				PERMISSION REQ: YES NO				CAMERA:						
FILM DEVELOPER:				#	DATE			EXPOSURES:						
#	LOCATION	AREA		COMMENT										
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
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36														

NUMBER ON FORM MUST MATCH WITH PICTURE
FILL OUT ONE FORM PER ROLL

INSPECTOR'S SIGNATURE _____ DATE _____

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11 FINAL REMARKS

The most important part of paint selection is care during application especially while checking the surface preparation, depth profile, drying time, recoating interval etc. For this there is a need of trained supervisor who is always with applicator technicians and checks these factors constantly. All the work should be checked every day and a daily report be made.

Once painting is over, periodic monitoring of structure, water cleaning must be done wherever required, any kind of paint deterioration must be recorded and maintained as per the procedure given above.

A Corrosion monitoring team of Manager with at least (8 members) 2 members from each plant must exclusively see the corrosion monitoring and maintenance work. This will help reducing the failures and substantially reduce the cost of maintenance.

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ANNEXURE I – TANK PAINTING SYSTEM (INTERNAL)

- Surface Preparation - Cu Slag blasting Sa 2.5
- Primer / Paint - Nos. of coats x DFT (Microns)

ANNEXURE I - TANK PAINTING SYSTEM (INTERNAL)

SN	Tank Service	Type of Surface Preparation	Tank Internal Coating		Remarks, if any
			Primer	Top Coat	
1	Naphtha, HSD	Manual Cleaning St2 / St3 Wire Brush, Sand Paper, Power Tools	Surface Tolerant Coating (High Build Epoxy Mastic 80 to 100 microns DFT)	Solventless Epoxy - Amine Based Hardner - 500 Microns	
2	Caustic			DL-AR - Nano Modified Epoxy Coating - 500 Microns	
3	Methanol			Solventless Epoxy - Amine Based Hardner - 500 Microns	
4	DM Water			Solventless Epoxy - Amine Based Hardner - 300 Microns	
5	Ammonia			DL-AR - Nano Modified Epoxy Coating - 500 Microns	
6	Iso-Propyl Alcohol			Solventless Epoxy - Amine Based Hardner - 500 Microns	
7	Weak Nitric Acid			DL-AR - Nano Modified Epoxy Coating - 500 Microns	
8	Concentrated Nitric Acid			DL-AR - Nano Modified Epoxy Coating - 1000 Microns	
9	Phosphoric Acid			DL-AR - Nano Modified Epoxy Coating - 1000 Microns	
10	Sulphuric Acid			DL-AR - Nano Modified Epoxy Coating - 1000 Microns	

Notes:

- 1 Only loose existing coating / corrosion product should be removed using St2/St3. No need to remove highly adherant existing paint coating or corrosion product. After wire brushing / sand paper cleaning the loose dust should be removed by either spraying water or using a wet sponge.
- 2 The volume solid of the surface tolerant coating should be above 80% to achieve 80-100 micron in one coat.
- 3 The DL-AR Nano based epoxy coating preferably can be applied using airless gun to the required thickness in one shot. If applied by brush, the next coat should be applied after the previous coat is atleast dry through

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ANNEXURE II – PROCEDURE FOR MEASUREMENT OF DFT

Definitions:

DFT	- Dry Film Thickness
Gauge Reading	- A single DFT reading at one point
Spot	- A circle of 4 cm diameter
Spot Measurement	- Average of acceptable three gauge readings within a spot (circle of 4 cm diameter)

Spot Measurement Procedure:

Minimum of three (3) gauge readings shall be made for each spot measurement of either the substrate or the coating. Repeated gauge readings, even at points close together, may differ due to small surface irregularities of the coating and the substrate. For each new gauge reading move the probe to a new location within 4 cm diameter circle defining the spot. Discard any unusually high or low reading that cannot be repeated consistently. Take the average of the acceptable gauge readings as the spot measurement.

Required Number of Measurements for Conformance to a thickness specification

Number of Measurements:

Make five (5) spot measurements spaced randomly over each 10 m² (100 ft²) area to be measured. No. of spot measurement beyond five for an area of 10 m² can be increased as decided by DFPCL. The five spot measurements shall be made for each 10 m² (100 ft²) of area as follows;

- a) For structures not exceeding 30 m² (300 ft²) in area, each 10 sq m² (100 ft²) area shall be measured.
- b) For structures not exceeding 100 m² (1000 ft²) in area, three 10 m² (100 ft²) areas shall be randomly selected and measured.
- c) For structures exceeding 100 m² (1000 ft²) in area, the first 10 m² (1000 ft²) shall be measured as stated in (b) above and for increment thereof or each additional 100 m² (1000 ft²) of area, one 10 m² (1000 ft²) area shall be randomly selected and measured.

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- d) If the dry film thickness for any 10 m² (100 ft²) area as mentioned in (b) & (c) above is not in compliance with the requirements of (e) & (f) as mentioned below, then additional measurements must be made to isolate the nonconforming area

Specifying Thickness:

Both a maximum and a minimum DFT should be specified for the coating. If a maximum thickness value is not explicitly specified, the specified thickness shall be minimum.

- e) Minimum Thickness : The average of five spot measurements for each 10 m² (100 ft²) area shall not be less than the specified minimum DFT. The average of three gauge readings at any single spot measurement in any 10 m² (100 ft²) area shall not be less than 80% of the specified minimum DFT. If the average of five spot measurements for a given 10 m² (100 ft²) area meets or exceeds the specified minimum DFT and any spot measurement does not meet 80% of the specified minimum DFT, additional spot measurements may be made to define the non-conforming areas.
- f) Maximum Thickness : The average of five spot measurements for each 10 m² (100 ft²) area shall not be more than the specified maximum DFT. No single spot measurement in any 10 m² (100 ft²) area shall be more than 120% of the specified minimum DFT. If the average of the five spot measurements of a given 10 m² (100 ft²) area meets or falls below the specified maximum DFT, but one or more spot measurements is more than 120% of the specified minimum DFT, additional spot measurements may be made to define the non-conforming area.
- g) Sample DFT measurement sheet is as indicated below;



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FORM 5

DFT MEASUREMENT WORKSHEET								DATE:	M	T	W	R	F	S	SU	#	Pg	of	
PROJECT/CLIENT:								PROJECT#:										COPY	
								INSPECTOR:											
LOCATION:								SPEC#:											
DESCRIPTION:								REVISION#											
ITEM:								ITEM:											
LOCATION	A R E A	SPOT READINGS						LOCATION	A R E A	SPOT READINGS									
		1	2	3	Total	%Min	Avg			1	2	3	Total	%Min	Avg				
A							A												
B							B												
C							C												
D							D												
E							E												
Approx. ft ² /m ²		Specified DFT		mils/μm		Total Avg.		mils/μm		Approx. ft ² /m ²		Specified DFT		mils/μm		Total Avg.		mils/μm	
Reference Inspection Report #								for application record											
ITEM:								ITEM:											
LOCATION	A R E A	SPOT READINGS						LOCATION	A R E A	SPOT READINGS									
		1	2	3	Total	%Min	Avg			1	2	3	Total	%Min	Avg				
A							A												
B							B												
C							C												
D							D												
E							E												
Approx. ft ² /m ²		Specified DFT		mils/μm		Total Avg.		mils/μm		Approx. ft ² /m ²		Specified DFT		mils/μm		Total Avg.		mils/μm	
Reference Inspection Report #								for application record											
ITEM:								ITEM:											
LOCATION	A R E A	SPOT READINGS						LOCATION	A R E A	SPOT READINGS									
		1	2	3	Total	%Min	Avg			1	2	3	Total	%Min	Avg				
A							A												
B							B												
C							C												
D							D												
E							E												
Approx. ft ² /m ²		Specified DFT		mils/μm		Total Avg.		mils/μm		Approx. ft ² /m ²		Specified DFT		mils/μm		Total Avg.		mils/μm	
Reference Inspection Report #								for application record											
D.F.T. GAUGE CALIBRATION RECORD																			
GAUGE TYPE MODEL	GAUGE SERIAL #	PLATE/SHIM mils/μm	BMR	ADJUST +/-	SPEC. AVERAGE COAT	D.F.T THIS COAT	D.F.T LAST COAT												
								INSPECTOR'S SIGNATURE										DATE	

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ANNEXURE III – PDS OF NANO MODIFIED PAINT (DL-AR)

Nano-modified Acid Resistant Coating (DL-AR)

Product Description

A High-build coating with nano-chemistry in epoxy resin, meant for highly aggressive environments, such as Chemical plants, refinery, petrochemicals, pickling plants, battery pit in Ships/sub-marine, waste water installations. The product stability up to 250°C. The product is suitable for application on steel as well as concrete surfaces.

Detailed immersion tests in various acids : 50% Sulfuric Acid, 10% HNO₃, 10% HCl, alkalies :10% NaOH and Calcium Chloride solution confirm its stability to aggressive environments.

TDS of DL-AR Coating

Product Description:

Product Data -Sheet

Type	Two Pack		
Mixing Ratio	Base: Hardener- 4:1		
Induction time	10 Minutes		
Pot Life	4-5 hours (@30 °C & 65% RH)		
Composition	Epoxy resin with suitable hardener fortified with nano particles		
Volume solids	80% ± 5%		
Application		Nozzle orifice	Nozzle pressure
	Brush	-----	-----
	Conventional spray	1.5-3 mm	3-4 kg/cm ²
	Airless spray	0.53-0.68mm	Not less than 176 kg/cm ²
Recommended DFT	150-1000 microns (based upon various applications)		
Theoretical Spreading Rate	@ 100 microns DFT 8 Sqmt per Lt		
Drying time	Surface: 4-5 Hrs (@30 °C & 65% RH) Hard Dry: Overnight (@30 °C & 65% RH)		
Over coating	Min 24 hr at max 7 days (@30 °C & 65% RH)		
Color	Grey and any inert shade / aluminum		
Finish	Semi Glossy to eggshell		
Thinner (MP Thinner)	Brush: 0-5% Conventional Spray: 8-10% Air less Spray: 0-3%		

Chemical Resistance against fumes and spillages:	Acid	Alkalis	Solvents	Salt water	Fresh water
		Excellent	Excellent	Excellent	Excellent
Temperature Resistance:	up to 250°C				
Weatherability:	Excellent with a suitable top coat				
Flexibility:	Very Good				

Test Report

Physical Properties

	% Volume Solids	Density	Viscosity	Pot life
1	79.5	1.6 g/cm ³	130 S	2 h

Chemical Tests

Sr. No.	Test Methods and Conditions	Acid Environment	Acid Resistant Nano Coating (DL-AR)
2	Result of Acid Resistance Test after 7 days in 50% H ₂ SO ₄ , 10% H ₂ SO ₄ , Conc. HCl, 5% HNO ₃ Phosphoric acid	50% H ₂ SO ₄	No effect on Coating
		10% H ₂ SO ₄	No effect on Coating
		Conc. HCl	No reaction slight colour change
		5% HNO ₃	No reaction slight colour change
		Phosphoric acid	No Effect on Coating
3	Salt Spray 4000 h	No blisters, de-lamination or cracks	

Mechanical Properties

Sr. No.	DFT (µm)	Bond strength MPa	Impact Strength (Joules)	Tabor Abrasion (mg)	Hardness (shore D)	Scratch Hardness (kg)
4	150	5.2	10	35	80	8
	500	8.77	7	50	85	9
	1000	10.2	6	92	90	10

Surface Preparation:

The coating can be applied on either fully blasted surface with cleanliness level of Sa21/2 or on a partially cleaned surface with or without Surface tolerant coating.

Storage & Shelf Life:

The product must be stored in accordance with National regulations. Keep the containers in a dry, cool, well ventilated space and away from source of heat and ignition. Container must be kept tightly closed. Shelf life- Minimum 12 months from the date of manufacturing; there after subject to inspection and /or high speed stirring.

Health and Safety:

Use under well ventilated conditions. Do not breathe or inhale mist. Avoid skin contact. Spillage on the skin should immediately be removed with suitable cleanser, soap and water. In case of accidental contact with eyes, flush with water and seek medical attention immediately. In case of ingestion seek medical help immediately. Do not induce vomiting.

Availability:

5l and 10l packs