VISHAL ENTERPRISE & VRISHAL ENGINEERING PRIVATE LIMITED

PROCEDURE FOR SURFACE PREPARATION & PROTECTIVE COATING

CLIENT: NAVIN FLUORINE ADVANCED SCIENCES LTD.

PROJECT: EPCM SERVICES FOR NEW HYDRO FLUORIC ACID PLANT

DOCUMENT NO: VEPL/NFASL/EPCM/QSI-002

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1. PURPOSE

The purpose of this document is to specify minimum requirements for the surface preparation and protective coating application to external surfaces of structure in the shop and in the field for the EPCM SERVICES FOR NEW HYDRO FLUORIC ACID PLANT Project.

2. SCOPE

This specification covers the minimum technical requirement of surface preparation, coating systems selection, application and Quality Inspection requirement for protective coating work on the exterior surfaces of new and repair of carbon steel structural items.

3. CODES AND STANDARDS

The surface preparation and protective coating shall be in accordance with the latest revision of the specifications, codes and standards.

- **SSPC (Steel Structures Painting Council)**
  Volume 1 Good Painting Practice
  Volume 2 Systems and Specifications
- **ISO 8501-1**
- **Swedish Standard**
  SIS 05 59 00 Pictorial Surface Preparation Standard for Painting Steel Surfaces
- **RAL & Munsell Book of color**
- **ANSI Z53.1 Safety color code for marking physical hazards**
  ANSI A13.1 Scheme for the identification of piping systems
- **BS 1710 Identification of pipe lines and services**

4. SAFETY

Appropriate safety equipment shall be provided for blasters, painters and other workers

involved in surface preparation and application of painting. Work area shall be adequately ventilated. Safety permits as necessary to carry out the operations shall be obtained.

5. EXTANT OF PAINTING

- Structural steel shall be externally painted in accordance with the applicable systems of this Project Specification.
- Structural items shall be prepared and painted only after completion of all non-destructive examinations, Visual and Dimension clearance.

6. PROCEDURE FOR NEW AND REPAIR

➢ SURFACE PREPARATION (BLAST CLEANING, POWER TOOL CLEANING, SOLVENT CLEANING, HAND CLEANING)

- This surface preparation requirement shall be in accordance with the SSPC (Volume 1&2) and the Swedish standard SIS 05 5900. (Reference to Table-1).
- The type of abrasive shall be chilled iron or steel grit, copper slag, alumina, or garnet. The particle size shall be selected to give a surface profile as per applicable coating system on carbon steels.
- Prior to surface preparation, surface shall be free from all traces of oil and grease. By utilize washing using a detergent dissolved in water followed by rinsing with clean fresh water rather than solvent washing until all traces of oil and grease are removed.
- The blasting nozzles shall be venturi type with tungsten carbide or boron carbide as the materials for liners. Nozzles orifice may vary from 3/16” to 3/4”.
- Compressed air shall be free from moisture and oil.
- The abrasives shall be used at a pressure of 7kg/cm^2 at appropriate distance and angle depending on nozzle size maintaining constant velocity and pressure. Abrasives shall be in the form of shot or grit of size suitable for achieving required anchor profile as specified in coating system.

- Commercial surface finish shall be in accordance with SSPC-SP-6. Near white surfaces shall be in accordance with SSPC-SP-10. White metal surface finish shall be in accordance with SSPC-SP-5. After blasting, any oil, dirt, grease or foreign matter deposited on blasted surfaces shall be cleaned before priming.
- Power tools cleaning shall be in accordance with SSPC-SP 3 and to a visual standard in accordance with SIS 05 5900 to ST3. Metal surface which cannot be blast cleaned due to their location, shall be totally power tools cleaned.
- Solvent cleaning shall be done in accordance with SSPC-SP-1. All the traces or smudges of oil grease (if present) shall be removed by solvent washing after blast cleaning.
- Steel surfaces with loose mill scale, rust and paint etc. may be cleaned by hand, using either or combination of hammer chipping, sanding scrapping and wire brushing in accordance with SSPC-SP 2.
- Blasting & Painting shall only be applied when the relative humidity is less than 85%, the steel temperature is a minimum of 3°C above the dew point.
- Blasting and Painting shall not be carried out in rainy and foggy weather.

➢ PAINT APPLICATION & MIXING

- All containers of coating materials shall be stored un-opened in original condition as supplied by the manufacturer until required for use. The containers should bear the manufacturers label batch numbers and instructions.
- Materials shall be stored in accordance with the manufacturer recommendations. For material having a limited shelf life, the date of manufacture and the length of the life shall be shown. Material older than their stated shelf life shall not be used. Deteriorated coating materials during storage shall not be used.
- During bad weather, rainy area, high wind painting shall not be done. If it is raining either during or immediately after the paint application, the proper steps, such as repainting, shall be taken.

- All ingredients in any container shall be thoroughly mixed before use to have a smooth and a uniform consistency in application. The mixture shall be sufficiently agitated with a power mixture during application until all the pigments, vehicles and catalysts are thoroughly mixed and then strained while being poured into the spray pot. During application the materials shall be agitated according to the manufacturer's recommendation. Coating material shall not be mixed or kept in suspension by using a bubbling air stream.

- Where a skin has formed in the container, the skin shall be cut loose and discarded. If such skins are sufficiently thick to have a practical effect on the composition and quality, the paint shall not be used.

- All pigmented material shall be strained after mixing except where application equipment is provided with adequate strainers. Strainers shall be capable of passing the pigment and removing any skin.

- If a coating material requires the addition of a catalyst the pot life under application condition shall be clearly stated on the label. This pot life shall not be exceeded under any circumstances. When the pot life is reached, the spray pot shall be emptied, cleaned and a new material catalyzed.

- Mixing and thinning direction as furnished the manufacturer shall be followed. Only thinners specified by the manufacturer shall be used.

- When use of thinner is permissible it shall be added during the mixing process. Painters shall not add thinner after it has been thinned to the proper consistency. All thinning shall be done under supervision of one acquainted with the correct amount and type to be added.

- Mixing shall be carried out as per the manufacturer recommendation and mixing details shall be maintained with batch number & quantity wise.

➢ COATING

- Only paint brands recommended as per NFASL**- ASIAN PPG/AKZONOBEL** and painting scheme with **ZINC SILICATE WITH DFT 215** shall be used.

- The paint manufacturer's recommendation shall be followed for mixing, thinning, storage, application of paint, drying time and weather condition.

- Spraying equipment shall meet the recommendations by the paint supplier. Paint application shall be carried out preferably by air less spray. The mixed coating shall be continuously stirred by mechanical spray pot agitator or other approved means. Coating shall be hand brushed (also roller application) for touch up areas and areas inaccessible to the spray gun. An additional layer of finish coat shall be hand brushed at edges, corners, welds and hard-to-spray areas to eliminate holidays in the final coats.

- Surface shall not be coated in rain, wind, fog, mist or in areas where injurious airborne elements exist, when the steel surface temperature is below 5^0C, when the difference of steel surface temperatures & dew point is less than 3^0C or when the relative humidity is greater than 85%.

- Blast cleaning surface shall be coated with one complete application of primer as soon as practicable but in no case later than 4 hours on the same day as abrasive blasted.

- Proper Protection / Shield shall be provided to the interference of Rain, Fog Mist, etc. during painting. The paint application area or blasting area shall be enclosed by suitable methods like enclosed sheds to avoid collection of floating abrasive dust on the wet paint during application of paint on structures, piping and equipment.

- Each coat shall be in a proper state of dryness before the application of succeeding coat. No paint shall be force dried which cause the deterioration of quality of painting. If the inter coating application time limit is exceeded to what have been specified by the paint manufacturer, then to prior re-coating remedial action shall be taken as per paint manufacturer's recommendations.

- Paint film thickness shall be maintained as indicated in coating system as per job specification, which is to be confirmed by suitable film thickness gauge. Each coat shall DFT not less than the minimum thickness indicated in coating system mentioned in specification.

- When paint has been damaged, all damaged and loosely adhering paint shall be removed and surface cleaned mechanically to bare metal. Priming shall be done in the area with primer specified to the required DFT. Then the 2nd& 3rd coat paint shall be applied.

- Proper care shall be taken to prevent damage to painted units during loading, unloading, handling and transport

- Inspection shall be carried out in presence of company representatives as per approved ITP. Inspection shall be carried out after surface preparation and after application of each coat of paint. Inspection shall be carried out to check paint thickness and to ensure that no runs and sags of paint have occurred. Inspection of wet & dry film thickness for primer and finish coat and wet film thickness for intermediate coat shall be carried out. All reading shall be recorded in the prescribe format.

- Edges of structural shapes and irregular coated surfaces shall be coated first and an extra pass made latter.

Following critical things are to be maintained while doing painting with the spray gun:

- Pressure pot, material hose and spray gun shall be kept at the same elevation where possible. When spraying inorganic zinc, the elevation difference shall not exceed 3 m.

- Traps or separators shall be provided to remove oil and condensed water from the air. These traps or separators must be of adequate size and must be drained periodically during operations, the air from the spray gun impinging against the surface shall show no condensed water or oil.

- The length of hose between the pressure pot and spray gun shall not exceed 15 m.

- An adequate moisture trap shall be installed between the air supply and each pressure pot. The trap shall be of the type that will continuously bleed off any water or oil from the air supply.

- Suitable pressure regulators and gauges shall be provided for both the air supply to the pressure pot and the air supply to the spray gun.

- The spray gun shall be held at right angle to the surface.
- Each pass with the spray gun shall overlap the previous pass by 50%.
- The spray width shall not exceed 300 mm. All runs and sags shall be immediately brushed out or the surface recoated.
- Areas inaccessible to the spray gun shall be painted by brush if not accessible by brush daubers or sheepskins shall be used. Brush shall be work paint into cracks crevices and blind spots which are not adequately painted by spray.
- Large surface shall receive two passes (except when applying inorganic zinc) at right angles to each other (crosshatched).

➢ REPAIR OF DAMAGE AREAS

Surface where coating is damaged after application of the finish coat shall be repaired as follows:

1: When the topcoat damaged, but base coat undamaged and the metal substrate are not exposed:

A) Damaged coating shall be removed with a hand file and abraded back to the sound coating using emery paper or a fine grinder.
B) The damaged area shall be wiped with a suitable solvent to remove debris. The periphery of repair area shall be feathered back for minimum distance of 25 mm into the adjacent undamaged coating by light abrasion or grinding to produce a smooth chamfered surface profile and Feathering of damaged coating edges shall be maintained.
C) Apply a new topcoat as specified.

2: Coating damaged to base metal:

A) The damaged area greater than 0.2 m^2 in area, the surface of exposed metal shall be prepared to the original specified standard prior to repairing by power tool

cleaning as per SSPC-ST3 or dry blasting to SSPC-SP5 and applying zinc rich epoxy primer, intermediate coat and final coat as specified.

B) The damaged areas less than 0.2 m^2 in area may be repaired as per manufactures recommendation or by preparing the surface of exposed metal by power tool cleaning as per SSPC-ST3 to the original specified standard and applying zinc rich epoxy primer, intermediate and final coat as specified.

C) Brush application is acceptable. Even appearance and smooth feathering into surrounding coating in addition to correct dry film thickness and holidays must be achieved. Coating and surrounding repaired areas shall not be damaged and complete tie-in of the coating with surrounding areas shall be damaged.

7. QUALITY ASSURANCE

7.1 INSPECTION AND TESTING

The following checking/testing shall be carried out in various stages of painting job.

A) Coating Materials

Check Batch No.: Manufacturing date and expiry date – Correlation with Paint TC.

Check physical condition of material and printed containers

Check any hard settling inside the container.

Check pot life or mixture mentioned in data sheet/MTD

Covering capacity and hiding power at a specified DFT.

B) During/after application

Whether conditions: Humidity and temperature of steel surface, ambient temperature & Dew Point

Surface preparation: Cleanliness & Roughness shall be as per the manufacturer recommendation.

Surface Salt Contamination

Overcoating Intervals

Wet film thickness / Dry film thickness

Visual examination of coating

Holiday detection

Adhesion test

7.2 REQUIREMENTS

- ANNEXURE: 1

8. PAINTING SYSTEM & DATA SHEET

- ANNEXURE: 2
- ANNEXURE: 3 PAINT DATA SHEET

9. REPORTING

- Surface Preparation & Painting Report format (Annexure-4)

TABLE – 1

Class	ISO	SSPC	Method	Degree
White Metal Blast cleaning	Sa 3.0	SP 5 SP 8	Sand blast, Grit blast Pickling (Phosphating)	Mill scale and other foreign substances shall be removed completely as steel surface becomes to white metal.
Near-white Blast cleaning	Sa 2.5	SP 10 SP 8	Sand blast, Grit blast Acid pickling (Etching)	Mill scale and other foreign substances shall be removed to approximately 95% degree.
Commercial Blast cleaning	Sa 2.0	SP 6	Sand blast, Grit blast	Mill scale and other foreing substances shall be removed to about 2/3 degree.
Brush off Blast Cleaning	Sa 1.0	SP 7	Sand blast, Grid blast	Loose mill scale, loose rust and other foreing substances shall be removed except firmly adhering mill scale.
Power Tool cleaning	St 3.0	SP 3 *SP11	Wire brushing by disc-sander.	Loose mill scale, loose rust and other foreing substances shall be removed except firmly adhering mill scale. * SP3 + surface roughness Ry5 > 25
Hand Tool cleaning	St 2.0	SP 2	Brushing by Hand	Only particularly loose rust and grease shall be removed except firmly adhering mill scale.
Solvent cleaning	-	SP-1	Solvent cleaning	Oil, grease, and dust shall be removed by solvents or alkali cleaning.

Note : ISO:SIS-Swedish Standard Institution and DIN are same specification.

SSPC- Steel Structures Painting Council. (USA)

ANNEXURE – 1

INSPECTION TEST	PARAMETER / METHOD	ACCEPTANCE CRITERIA	EXTENT / FREQUENCY OF INSPECTION AND TESTING
Visual Examination piror to blasting	Rust, ISO 8501-1	Grade B or better	100% of all surfaces
	Surface defects	None	
	Oil, grease, Liquids	None	
Environmental Conditions	Ambient Temperature	Minimum 5° C	At start, middle and end of each shift
	Steel Temperature	T > DP + 3° C Minimum	
	Relative Humidity	< 85%	
Dust Particle quantity and size	ISO 8502-3	Rating 2 or better	Once on 10% of total no. of components per Batch
Cleanliness	ISO 8501-1	SSPC SP10	100% of all surfaces
Roughness	ISO 8503	40 - 75 Microns	Once on each batch
Visual Examination of coating	Pinholes, Blisters, Cracks etc.	No defects	100% of all surfaces
Film Thickness	SSPC PA 2	Final DFT Min 215 Microns	10% of total batch area

ANNEXURE – 2

STAGE	PAINT	PROFILE / DFT (MICRONS)	REMARKS
SURFACE PREPARATION	--	40-75	SA 2 1/2 Cu (Copper Slag/Grit Blasting)
PRIMER COAT	Interzinc 78i/ Sigma 158	75	Thinner: Grade T-144
INTERMEDIATE COAT	Intergard 475/ Sigma 620	90	Thinner: Grade T-141
FINAL COAT	Interthane 990/ Sigmadur 550	50	Thinner: Grade T-213
	TOTAL	Min. 215 Microns	

SIGMAZINC™ 158

DESCRIPTION

Two-component, moisture-curing zinc (ethyl) silicate primer

PRINCIPAL CHARACTERISTICS

- Certificate for ASTM A-490 class 'B' for slip coefficient
- Complies with the compositional requirements of SSPC-Paint 20, Level 2
- Anticorrosive primer for structural steel
- Suitable as a system primer in various paint systems based on unsaponifiable binders
- Galvanic action eliminates sub-film corrosion
- Can withstand substrate temperatures from –90°C (–130°F) up to 400°C (750°F), under normal atmospheric exposure conditions
- When suitably topcoated provides excellent corrosion protection for steel substrates up to 540°C (1000°F)
- Good low-temperature curing
- Good impact and abrasion resistance
- Must not be exposed to alkaline (more than pH 9) or acidic (less than pH 5.5) liquids

COLOR AND GLOSS LEVEL

- Gray, greenish gray
- Flat

BASIC DATA AT 20°C (68°F)

Data for mixed product	
Number of components	Two
Mass density	2.3 kg/l (19.2 lb/US gal)
Volume solids	65 ± 2%
VOC (Supplied)	Directive 1999/13/EC, SED: max. 219.0 g/kg max. 507.0 g/l (approx. 4.2 lb/US gal)
Recommended dry film thickness	75 - 100 µm (3.0 - 4.0 mils) depending on system
Theoretical spreading rate	8.7 m^2/l for 75 µm (348 ft^2/US gal for 3.0 mils)
Dry to touch	30 minutes
Overcoating Interval	Minimum: 12 hours Maximum: Unlimited
Full cure after	12 hours
Shelf life	Binder: at least 9 months when stored cool and dry Pigment: at least 24 months when stored pigment moisture free

Notes:
- See ADDITIONAL DATA – Spreading rate and film thickness
- See ADDITIONAL DATA – Overcoating intervals
- See ADDITIONAL DATA – Curing time

SIGMAZINC™ 158

RECOMMENDED SUBSTRATE CONDITIONS AND TEMPERATURES

Immersion exposure

- Steel; blast cleaned to ISO-Sa2½, blasting profile 40 – 70 µm (1.6 – 2.8 mils)
- Steel with approved zinc silicate shop primer; sweep blasted to SPSS-Ss, welds, rusty and damaged areas blast cleaned to ISO-Sa2½

Atmospheric exposure conditions

- Steel; blast cleaned to ISO-Sa2½, blasting profile 40 – 70 µm (1.6 – 2.8 mils)
- Steel with approved zinc silicate shop primer; pretreated to to SPSS-Pt3

Substrate temperature and application conditions

- Substrate temperature during application and curing down to -5°C (23°F) is acceptable; provided the substrate is free from ice and dry
- Substrate temperature during application up to 50°C (122°F) is acceptable
- Substrate temperature during application and curing should be at least 3°C (5°F) above dew point
- Relative humidity during curing should be above 50%

INSTRUCTIONS FOR USE

Mixing ratio by volume: binder to zinc powder 81:19

- Many of PPG's zinc silicates are supplied as two-pack materials consisting of a container with pigmented binder and a drum containing a bag of zinc powder.
- To ensure proper mixing of both components, the instructions given below must be followed
- To avoid lumps in the paint do not add the binder to the zinc powder
- [1] Take the bag with zinc powder out of the drum
- [2] Shake the binder in the jerrycan a few times to reach a certain degree of homogenization
- [3] Pour about 2/3 of the binder into the empty drum
- [4] With the jerrycan now reduced in weight and containing more free space, shake it vigorously to obtain a homogeneous mix with no deposits left on the bottom, and add this to the drum
- [5] Add the zinc powder gradually to the pigmented binder in the drum and, at the same time, continuously stir the mixture by using a mechanical mixer (keep the speed low)
- [6] Stir the zinc dust powder thoroughly through the binder (high speed) and keep stirring until a homogeneous mixture is obtained
- [7] Strain mixture through a 30 – 60 mesh screen
- [8] Agitate continuously during application (low speed). The use of a dedicated pump with a constant agitation for a zinc silicate coating is recommended

Note: At application temperature above 30°C (86°F) addition of max 10% by volume of THINNER 90-53 may be necessary

Induction time

None

SIGMAZINC™ 158

Pot life
12 hours at 20°C (68°F)

Note: See ADDITIONAL DATA – Pot life

Air spray

Recommended thinner
THINNER 90-53

Volume of thinner
0 - 10%, depending on required thickness and application conditions

Nozzle orifice
2.0 mm (approx. 0.079 in)

Nozzle pressure
0.3 MPa (approx. 3 Bar; 44 p.s.i.)

Note: A dedicated pump for a zinc silicate coating with constant agitation must be used

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Airless spray

Recommended thinner
THINNER 90-53

Volume of thinner
0 - 10%, depending on required thickness and application conditions

Nozzle orifice
Approx. 0.48 – 0.64 mm (0.019 – 0.025 in)

Nozzle pressure
9.0 - 12.0 MPa (approx. 90 - 120 bar; 1306 - 1741 p.s.i.)

Note: A dedicated pump for a zinc silicate coating with constant agitation must be used

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SIGMAZINC™ 158

Brush/roller
- Only for touch-up and spot repair
- Roller application is not recommended

Recommended thinner
THINNER 90-53

Volume of thinner
5 – 15%

Note: Apply a visible wet coat with a max. dft of 25 µm (1.0 mils)|same for subsequent coats in order to obtain the required dft

Cleaning solvent
THINNER 90-53

Upgrading
- This is only valid for spray application
- If the DFT is below specification and an extra coat of SIGMAZINC 158 has to be applied, SIGMAZINC 158 should be thinned down with 25 – 50% THINNER 90-53, in order to obtain a visible wet coat that remains wet for some time

ADDITIONAL DATA

Spreading rate and film thickness	
DFT	**Theoretical spreading rate**
75 µm (3.0 mils)	8.7 m^2/l (348 ft^2/US gal)
100 µm (4.0 mils)	6.5 m^2/l (261 ft^2/US gal)

Notes:
- Maximum DFT when brushing: 35 µm (1.4 mils)
- Above 150 µm (6.0 mils) mudcracking can occur
- Average DFT 75 µm (3.0 mils) with a minimum of 60 µm (2.4 mils) on smooth non-pitted blast cleaned steel
- Average DFT 100 µm (4.0 mils) with a minimum of 75 µm (3.0 mils) on rough or pitted, blast cleaned steel

SIGMAZINC™ 158

Overcoating interval for DFT up to 100 µm (4.0 mils) and 50% relative humidity							
Overcoating with...	**Interval**	**-5°C (23°F)**	**0°C (32°F)**	**10°C (50°F)**	**20°C (68°F)**	**30°C (86°F)**	**40°C (104°F)**
recommended topcoats	Minimum Maximum	24 hours Unlimited	24 hours Unlimited	18 hours Unlimited	12 hours Unlimited	6 hours Unlimited	4 hours Unlimited

Notes:

- For recoating with itself to take required dft, recommend to apply within 2 days before full cure. No minimum recoating interval limitation for itself.
- To confirm cure to topcoat, conduct a MEK rub test per ASTM D4752. A rating of 4 or higher is sufficient for topcoating
- For measuring of the curing, the MEK rub test according to ASTM 4752 is a suitable method: after 50 double rubs with a cloth soaked in MEK (or alternatively THINNER 90-53) no dissolving of the coating should be observed
- Curing/recoating time will be shortened by the increase of humidity, please contact regional technical service team for details
- A mist coat / full coating application technique is required when topcoating to prevent application bubbling. Ensure dry spray is removed from the surface
- SIGMAZINC 158 is a moisture curing zinc silicate, this means that it cures after sufficient exposure to moisture from the atmosphere during and after application; it is recommended that relative humidity and temperature are measured during the curing time
- When curing conditions are unfavorable or when reduced overcoat times are desired, curing can be accelerated 4 hours after application by: [1] Wetting or soaking with water, keeping the surface wet for the next 2 hours, followed by drying; [2] Wetting or soaking with a 0.5% ammonia solution, followed by drying
- Maximum interval is only unlimited when the surface is free from any contamination

Curing time for DFT up to 100 µm (4.0 mils) and 50% relative humidity		
Substrate temperature	**Dry to handle**	**Full cure**
-5°C (23°F)	2 hours	24 hours
0°C (32°F)	2 hours	24 hours
10°C (50°F)	1 hour	18 hours
20°C (68°F)	30 minutes	12 hours
30°C (86°F)	30 minutes	6 hours
40°C (104°F)	30 minutes	4 hours

Notes:

- SIGMAZINC 158 is a moisture curing zinc silicate, this means that it only cures after sufficient take up of water, (from the atmosphere) during and after application
- It is recommended that relative humidity and temperature are measured during the curing time
- Relative humidity during curing recommended to be above 50%
- Adequate ventilation must be maintained during application and curing (please refer to INFORMATION SHEETS 1433 and 1434)

Pot life (at application viscosity)	
Mixed product temperature	**Pot life**
0°C (32°F)	24 hours
10°C (50°F)	16 hours
20°C (68°F)	12 hours
30°C (86°F)	6 hours

SIGMAZINC™ 158

SAFETY PRECAUTIONS

- For paint and recommended thinners see INFORMATION SHEETS 1430, 1431 and relevant Material Safety Data Sheets
- This is a solvent-borne paint and care should be taken to avoid inhalation of spray mist or vapor, as well as contact between the wet paint and exposed skin or eyes

WORLDWIDE AVAILABILITY

It is always the aim of PPG Protective and Marine Coatings to supply the same product on a worldwide basis. However, slight modification of the product is sometimes necessary to comply with local or national rules/circumstances. Under these circumstances an alternative product data sheet is used.

REFERENCES

• CONVERSION TABLES	INFORMATION SHEET	1410
• EXPLANATION TO PRODUCT DATA SHEETS	INFORMATION SHEET	1411
• SAFETY INDICATIONS	INFORMATION SHEET	1430
• SAFETY IN CONFINED SPACES AND HEALTH SAFETY, EXPLOSION HAZARD – TOXIC HAZARD	INFORMATION SHEET	1431
• SAFE WORKING IN CONFINED SPACES	INFORMATION SHEET	1433
• DIRECTIVES FOR VENTILATION PRACTICE	INFORMATION SHEET	1434
• CLEANING OF STEEL AND REMOVAL OF RUST	INFORMATION SHEET	1490
• SPECIFICATION FOR MINERAL ABRASIVES	INFORMATION SHEET	1491
• RELATIVE HUMIDITY – SUBSTRATE TEMPERATURE – AIR TEMPERATURE	INFORMATION SHEET	1650

WARRANTY

PPG warrants (i) its title to the product, (ii) that the quality of the product conforms to PPG's specifications for such product in effect at the time of manufacture and (iii) that the product shall be delivered free of the rightful claim of any third person for infringement of any U.S. patent covering the product. THESE ARE THE ONLY WARRANTIES THAT PPG MAKES AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, UNDER STATUTE OR ARISING OTHERWISE IN LAW, FROM A COURSE OF DEALING OR USAGE OF TRADE, INCLUDING WITHOUT LIMITATION, ANY OTHER WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE DISCLAIMED BY PPG. Any claim under this warranty must be made by Buyer to PPG in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life of the product, or one year from the date of the delivery of the product to the Buyer, whichever is earlier. Buyer's failure to notify PPG of such non-conformance as required herein shall bar Buyer from recovery under this warranty.

LIMITATIONS OF LIABILITY

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SIGMACOVER™ 620

DESCRIPTION

Two-component, surface-tolerant, high-build, polyamide-cured epoxy primer/coating

PRINCIPAL CHARACTERISTICS

- Excellent corrosion resistance
- Good flexibility
- Surface tolerant coating for lower grade of steel preparation
- Good drying and curing property
- Easy application by different application methods such as airless spray, brush etc.
- Low temperature version available if required

COLOR AND GLOSS LEVEL

- Gray, off-white (other colors available on request)
- Aluminum colors (dark gray, light gray)
- Eggshell

BASIC DATA AT 20°C (68°F)

Data for mixed product	
Number of components	Two
Mass density	1.5 kg/l (12.5 lb/US gal)
Volume solids	80 ± 2%
VOC (Supplied)	Directive 1999/13/EC, SED: max. 150.0 g/kg UK PG 6/23(92) Appendix 3: max. 225.0 g/l (approx. 1.9 lb/US gal)
Recommended dry film thickness	75 - 250 µm (3.0 - 10.0 mils) depending on system
Theoretical spreading rate	6.4 m^2/l for 125 µm (257 ft^2/US gal for 5.0 mils)
Dry to touch	3 hours
Overcoating Interval	Minimum: 8 hours Maximum: 6 months
Full cure after	7 days
Shelf life	Base: at least 24 months when stored cool and dry Hardener: at least 24 months when stored cool and dry

Notes:
- See ADDITIONAL DATA – Spreading rate and film thickness
- See ADDITIONAL DATA – Overcoating intervals
- See ADDITIONAL DATA – Curing time

SIGMACOVER™ 620

RECOMMENDED SUBSTRATE CONDITIONS AND TEMPERATURES

Atmospheric exposure conditions

- Steel; blast cleaned to ISO-Sa2½ for excellent corrosion protection
- Steel; blast cleaned to ISO-Sa2 or power tool cleaned to ISO-St2 for good corrosion protection
- Shop primed steel; pretreated to SPSS-Pt2
- Galvanized steel; sweep blasted to roughen the surface and to remove any zinc salts which might be present
- Stainless steel; degreased and sweep blast (SSPC SP-16) cleaned to roughness of 40 – 70 µm (1.5 – 2.8 mils) with non-ferrous abrasive

Immersion exposure

- Steel; blast cleaned to ISO-Sa2½
- Steel with approved zinc silicate shop primer; sweep blasted to SPSS-Ss or power tool cleaned to SPSS-Pt3

Substrate temperature

- Substrate temperature during application and curing should be above 5°C (41°F)
- Substrate temperature during application and curing should be at least 3°C (5°F) above dew point

INSTRUCTIONS FOR USE

Mixing ratio by volume: base to hardener 80:20 (4:1)

- The temperature of the mixed base and hardener should preferably be above 15°C (59°F), otherwise extra thinner may be required to obtain application viscosity
- Adding too much thinner results in reduced sag resistance and slower cure
- Thinner should be added after mixing the components

Induction time

Mixed product induction time	
Mixed product temperature	**Induction time**
Above 10°C (50°F)	None

Pot life

4 hours at 20°C (68°F)

Note: See ADDITIONAL DATA – Pot life

SIGMACOVER™ 620

Airless spray

Recommended thinner
THINNER 91-92

Volume of thinner
0 - 10%, depending on required thickness and application conditions

Nozzle orifice
Approx. 0.46 – 0.53 mm (0.018 – 0.021 in)

Nozzle pressure
20.0 - 25.0 MPa (approx. 200 - 250 bar; 2901 - 3626 p.s.i.)

Brush/roller

- Application by roller will leave roller marking and is suitable for minimum DFT requirements only
- A roller suitable for epoxy application must be used

Recommended thinner
THINNER 91-92

Volume of thinner
0 – 5%

Cleaning solvent
THINNER 90-53

ADDITIONAL DATA

Spreading rate and film thickness	
DFT	**Theoretical spreading rate**
75 µm (3.0 mils)	10.7 m^2/l (428 ft^2/US gal)
100 µm (4.0 mils)	8.0 m^2/l (321 ft^2/US gal)
125 µm (5.0 mils)	6.4 m^2/l (257 ft^2/US gal)
150 µm (6.0 mils)	5.3 m^2/l (214 ft^2/US gal)
200 µm (8.0 mils)	4.0 m^2/l (160 ft^2/US gal)

SIGMACOVER™ 620

Overcoating interval for DFT up to 125 µm (5.0 mils): Atmospheric exposure						
Overcoating with...	**Interval**	**5°C (41°F)**	**10°C (50°F)**	**20°C (68°F)**	**30°C (86°F)**	**40°C (104°F)**
various two-pack epoxy and polyurethane coatings	Minimum	48 hours	24 hours	8 hours	4 hours	2 hours
	Maximum exposed to direct sunshine	3 months	3 months	3 months	3 months	3 months
	Maximum NOT exposed to direct sunshine	6 months	6 months	6 months	6 months	6 months

Note: Surface should be dry and free from any contamination and sufficiently roughened after long exposure

Overcoating interval for DFT up to 125 µm (5.0 mils): Immersion exposure						
Overcoating with...	**Interval**	**5°C (41°F)**	**10°C (50°F)**	**20°C (68°F)**	**30°C (86°F)**	**40°C (104°F)**
various two-component epoxy coatings	Max recoat immersion minimum interval	48 hours	24 hours	8 hours	4 hours	2 hours
	Max recoat immersion maximum interval	2 months	2 months	2 months	2 months	2 months

Note: Surface should be dry and free from any contamination and sufficiently roughened after long exposure

Curing time for DFT up to 125 µm (5.0 mils)			
Substrate temperature	**Dry to touch**	**Dry to handle**	**Full cure**
5°C (41°F)	24 hours	48 hours	20 days
10°C (50°F)	12 hours	24 hours	14 days
20°C (68°F)	3 hours	8 hours	7 days
30°C (86°F)	2 hours	6 hours	4 days
40°C (104°F)	1 hour	3 hours	3 days

Note: Adequate ventilation must be maintained during application and curing (please refer to INFORMATION SHEETS 1433 and 1434)

Pot life (at application viscosity)	
Mixed product temperature	**Pot life**
10°C (50°F)	10 hours
15°C (59°F)	6 hours
20°C (68°F)	4 hours
30°C (86°F)	2 hours
40°C (104°F)	1 hour

SIGMACOVER™ 620

SAFETY PRECAUTIONS

- For paint and recommended thinners see INFORMATION SHEETS 1430, 1431 and relevant Material Safety Data Sheets
- This is a solvent-borne paint and care should be taken to avoid inhalation of spray mist or vapor, as well as contact between the wet paint and exposed skin or eyes

WORLDWIDE AVAILABILITY

It is always the aim of PPG Protective and Marine Coatings to supply the same product on a worldwide basis. However, slight modification of the product is sometimes necessary to comply with local or national rules/circumstances. Under these circumstances an alternative product data sheet is used.

REFERENCES

• EXPLANATION TO PRODUCT DATA SHEETS	INFORMATION SHEET	1411
• SAFETY INDICATIONS	INFORMATION SHEET	1430
• SAFETY IN CONFINED SPACES AND HEALTH SAFETY, EXPLOSION HAZARD – TOXIC HAZARD	INFORMATION SHEET	1431
• SAFE WORKING IN CONFINED SPACES	INFORMATION SHEET	1433
• DIRECTIVES FOR VENTILATION PRACTICE	INFORMATION SHEET	1434

WARRANTY

PPG warrants (i) its title to the product, (ii) that the quality of the product conforms to PPG's specifications for such product in effect at the time of manufacture and (iii) that the product shall be delivered free of the rightful claim of any third person for infringement of any U.S. patent covering the product. THESE ARE THE ONLY WARRANTIES THAT PPG MAKES AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, UNDER STATUTE OR ARISING OTHERWISE IN LAW, FROM A COURSE OF DEALING OR USAGE OF TRADE, INCLUDING WITHOUT LIMITATION, ANY OTHER WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR USE, ARE DISCLAIMED BY PPG. Any claim under this warranty must be made by Buyer to PPG in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life of the product, or one year from the date of the delivery of the product to the Buyer, whichever is earlier. Buyer's failure to notify PPG of such non-conformance as required herein shall bar Buyer from recovery under this warranty.

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IN NO EVENT WILL PPG BE LIABLE UNDER ANY THEORY OF RECOVERY (WHETHER BASED ON NEGLIGENCE OF ANY KIND, STRICT LIABILITY OR TORT) FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO, ARISING FROM, OR RESULTING FROM ANY USE MADE OF THE PRODUCT. The information in this sheet is intended for guidance only and is based upon laboratory tests that PPG believes to be reliable. PPG may modify the information contained herein at any time as a result of practical experience and continuous product development. All recommendations or suggestions relating to the use of the PPG product, whether in technical documentation, or in response to a specific inquiry, or otherwise, are based on data, which to the best of PPG's knowledge, is reliable. The product and related information is designed for users having the requisite knowledge and industrial skills in the industry and it is the end-user's responsibility to determine the suitability of the product for its own particular use and it shall be deemed that Buyer has done so, as its sole discretion and risk. PPG has no control over either the quality or condition of the substrate, or the many factors affecting the use and application of the product. Therefore, PPG does not accept any liability arising from any loss, injury or damage resulting from such use or the contents of this information (unless there are written agreements stating otherwise). Variations in the application environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results. This sheet supersedes all previous versions and it is the Buyer's responsibility to ensure that this information is current prior to using the product. Current sheets for all PPG Protective & Marine Coatings Products are maintained at www.ppgpmc.com. The English text of this sheet shall prevail over any translation thereof.

SIGMADUR™ 550

DESCRIPTION

Two-component, aliphatic acrylic polyurethane finish

PRINCIPAL CHARACTERISTICS

- Unlimited recoatable
- Excellent resistance to atmospheric exposure conditions
- Excellent color and gloss retention
- Non-chalking, non-yellowing
- Cures at temperatures down to -5°C (23°F)
- Resistant to splash of mineral and vegetable oils, paraffins, aliphatic petroleum products and mild chemicals
- Can be recoated even after long atmospheric exposure
- Good application properties

COLOR AND GLOSS LEVEL

- White and various other colors (see also SIGMACARE shade card)
- Gloss

BASIC DATA AT 20°C (68°F)

Data for mixed product	
Number of components	Two
Mass density	1.3 kg/l (10.8 lb/US gal)
Volume solids	55 ± 2%
VOC (Supplied)	Directive 1999/13/EC, SED: max. 334.0 g/kg max. 430.0 g/l (approx. 3.6 lb/US gal) EUR Directive: 2004/42/IIA(j)(500) 459 g/l)
Recommended dry film thickness	50 - 60 µm (2.0 - 2.4 mils) depending on system
Theoretical spreading rate	11.0 m^2/l for 50 µm (441 ft^2/US gal for 2.0 mils)
Dry to touch	1 hour
Overcoating Interval	Minimum: 6 hours Maximum: Unlimited
Full cure after	4 days
Shelf life	Base: at least 36 months when stored cool and dry Hardener: at least 24 months when stored cool and dry

Notes:
- See ADDITIONAL DATA – Spreading rate and film thickness
- See ADDITIONAL DATA – Overcoating intervals
- See ADDITIONAL DATA – Curing time

SIGMADUR™ 550

RECOMMENDED SUBSTRATE CONDITIONS AND TEMPERATURES

Substrate conditions

- Previous coat (epoxy or polyurethane) must be dry and free from any contamination
- Previous coat: surface should be sufficiently roughened if necessary

Substrate temperature and application conditions

- Substrate temperature during application at -5°C (23°F) is acceptable; provided the substrate is free from ice and dry
- Substrate temperature during application and curing should be at least 3°C (5°F) above dew point
- Relative humidity during application and curing should not exceed 85%
- Should condensation on the surface occur during, or soon after application, this could result in color and gloss change

INSTRUCTIONS FOR USE

Mixing ratio by volume: base to hardener 88:12

- The temperature of the mixed base and hardener should be above 10°C (50°F), otherwise extra thinner may be required to obtain application viscosity
- Thinner should be added after mixing the components
- Adding too much thinner results in reduced sag resistance

Induction time

None

Pot life

5 hours at 20°C (68°F)

Note: See ADDITIONAL DATA – Pot life

Air spray

Recommended thinner

THINNER 21-06

Volume of thinner

3 - 5%, depending on required thickness and application conditions

Nozzle orifice

1.0 - 1.5 mm (approx. 0.040 - 0.060 in)

Nozzle pressure

0.3 - 0.4 MPa (approx. 3 - 4 bar; 44 - 58 p.s.i.)

SIGMADUR™ 550

Airless spray

Recommended thinner
THINNER 21-06

Volume of thinner
3 - 5%, depending on required thickness and application conditions

Nozzle orifice
Approx. 0.43 – 0.48 mm (0.017 – 0.019 in)

Nozzle pressure
20.0 MPa (approx. 200 bar; 2901 p.s.i.)

Brush/roller

Recommended thinner
THINNER 21-06

Volume of thinner
0 – 5%

Cleaning solvent
THINNER 90-53

ADDITIONAL DATA

Spreading rate and film thickness	
DFT	**Theoretical spreading rate**
50 µm (2.0 mils)	11.0 m^2/l (441 ft^2/US gal)
60 µm (2.4 mils)	9.2 m^2/l (368 ft^2/US gal)

Overcoating interval for DFT up to 50 µm (2.0 mils)							
Overcoating with...	**Interval**	**-5°C (23°F)**	**0°C (32°F)**	**10°C (50°F)**	**20°C (68°F)**	**30°C (86°F)**	**40°C (104°F)**
itself	Minimum	24 hours	16 hours	8 hours	6 hours	5 hours	3 hours
	Maximum	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited

Note: Surface should be dry and free from any contamination

SIGMADUR™ 550

Curing time for DFT up to 60 µm (2.4 mils)		
Substrate temperature	**Dry to handle**	**Full cure**
-5°C (23°F)	24 hours	15 days
0°C (32°F)	16 hours	11 days
10°C (50°F)	8 hours	6 days
20°C (68°F)	6 hours	4 days
30°C (86°F)	5 hours	3 days
40°C (104°F)	3 hours	48 hours

Notes:
- Adequate ventilation must be maintained during application and curing (please refer to INFORMATION SHEETS 1433 and 1434)
- Premature exposure to early condensation and rain may cause color and gloss change

Pot life (at application viscosity)	
Mixed product temperature	**Pot life**
10°C (50°F)	7 hours
20°C (68°F)	5 hours
30°C (86°F)	3 hours
40°C (104°F)	2 hours

SAFETY PRECAUTIONS

- For paint and recommended thinners see INFORMATION SHEETS 1430, 1431 and relevant Material Safety Data Sheets
- This is a solvent-borne paint and care should be taken to avoid inhalation of spray mist or vapor, as well as contact between the wet paint and exposed skin or eyes
- Contains a toxic polyisocyanate curing agent
- Avoid at all times inhalation of aerosol spray mist

WORLDWIDE AVAILABILITY

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SIGMADUR™ 550

REFERENCES

• CONVERSION TABLES	INFORMATION SHEET	1410
• EXPLANATION TO PRODUCT DATA SHEETS	INFORMATION SHEET	1411
• SAFETY INDICATIONS	INFORMATION SHEET	1430
• SAFETY IN CONFINED SPACES AND HEALTH SAFETY, EXPLOSION HAZARD – TOXIC HAZARD	INFORMATION SHEET	1431
• SAFE WORKING IN CONFINED SPACES	INFORMATION SHEET	1433
• DIRECTIVES FOR VENTILATION PRACTICE	INFORMATION SHEET	1434
• RELATIVE HUMIDITY – SUBSTRATE TEMPERATURE – AIR TEMPERATURE	INFORMATION SHEET	1650

WARRANTY

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LIMITATIONS OF LIABILITY

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Annexure-4

VISHAL ENTERPRISE & VRISHAL ENGINEERING PRIVATE LIMITED
GROUP OF COMPANIES

SURFACE PREPARATION & PAINTING REPORT (STR)

CLIENT				**PROJECT**					**REPORT NO**		
WO NO				**ITP NO**					**DATE**		
WEATHER CONDITION											
TIME	8:30	9:30	10:30	11:30	12:30	13:30	14:30	15:30	16:30	17:30	18:30
DEW POINT° C											
METAL TEMP° C											
REL. HUMIDITY %											
AMBIENT TEMP° C											

SURFACE CONDITION					
ORIGINAL STATUS		METAL CONDITION		METAL RUST GRADE	
SURFACE PREPARATION					
METHOD		PREP. STANDARD			
ABRASIVE TYPE		ABRASIVE BRAND		ABRASIVE BATCH	
SURFACE PROFILE		PROFILE RANGE		INSTRUMENT	
MILL SCALE		SALT TEST REQUIRED		SALT TEST READING	
DUST LEVEL					
PRIMER COATING					
PRIMER PAINT/SHADE		APP. METHOD		PRIMER DATE	
PAINT MANUFACTURER		BASE		TIME	
PRIMER PAINT IMIR NO		MANUFACTURE DATE		HARDNER	
DFT RANGE		PAINTING SYSTEM		SHELF LIFE	
INTERMEDIATE COATING					
INTERMEDIATE PAINT/SHADE		APP. METHOD		INTERMEDIATE DATE	
PAINT MANUFACTURER		BASE		TIME	
PAINT IMIR NO		MANUFACTURE DATE		HARDNER	
DFT RANGE		PAINTING SYSTEM		SHELF LIFE	
FINAL COATING					
FINAL PAINT/SHADE		APP. METHOD		FINAL DATE	
PAINT MANUFACTURER		BASE		TIME	
PAINT IMIR NO		MANUFACTURE DATE		HARDNER	
DFT RANGE		PAINTING SYSTEM		SHELF LIFE	

SR. NO.	DRAWING NO.	TAG NO	QTY	Average DFT			REMARKS
				PRIMER	INTERMEDIATE	FINAL	

NOTE:

	VEPL- QC	CLIENT QC / TPIA
SIGN		
NAME		
DATE		

VE/QA/FORMAT/23 REV.3