Base Load Power Hub (BLPH)

Painting specification for container

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

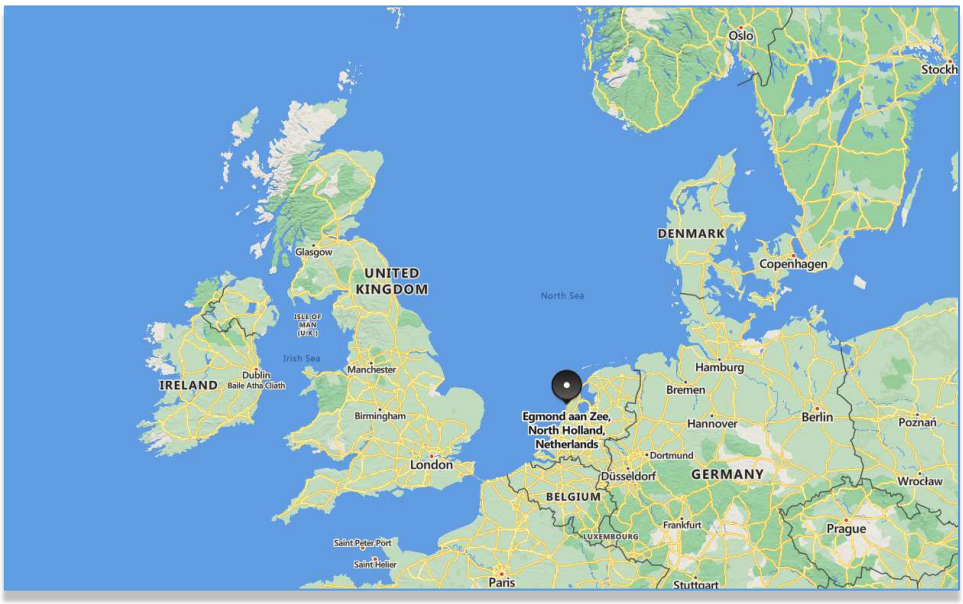


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

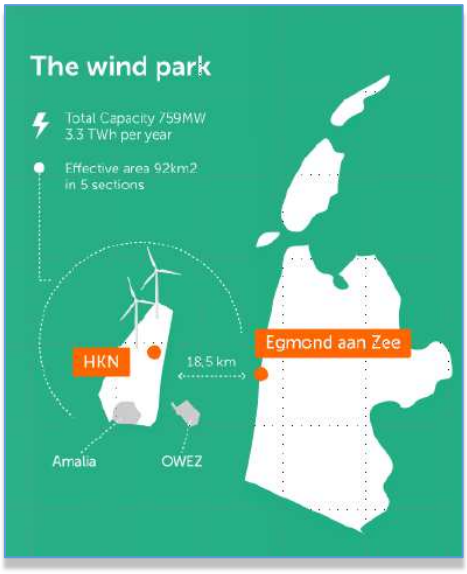


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

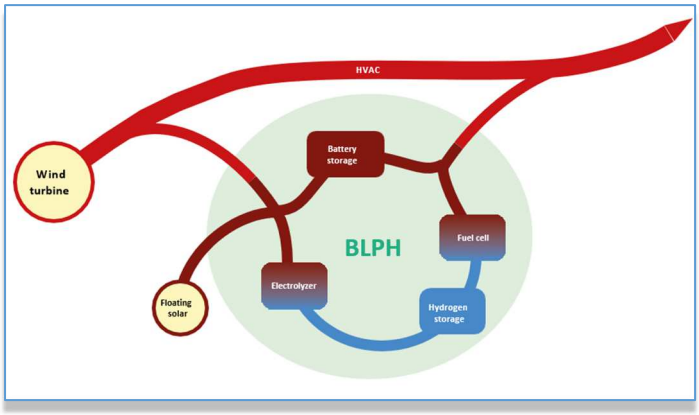


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

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2 DOCUMENT SCOPE

This specification covers the control of materials and the procedure to be followed in the course of surface preparation, painting/coating application, inspection and safety requirements for corrosion proofing of the metallic surfaces from atmospheric attack by means of protective coating, installed outdoor.

Detailed applicable painting cycles are also described in this procedure.

2.1 REFERENCES

This specification has been developed considering the client requirement of environment corrosivity category C3 according to EN ISO 12944

3 SURFACE PREPARATION

All steel components, prior to forming, will be shot-blasted to a SA 2.5 standard surface by means of an automatic centrifugal shot surface cleaning machine. A weld-able primer compatible to the paint system will be applied immediately to a thickness of 10 micron to preserve the surface integrity during the assembly process. After the container is assembled it is shot-blasted again manually to clean all the welds and any other area that was contaminated during the assembly process. Slags and spatters are removed by means of grinding or needle hammers

The surfaces hot dip galvanized shall be prepared as per SSPC-SP 16.

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4 APPLICATION

Coats shall be thinned and/or mixed according to manufacturer's product data sheet. The mixing shall be very accurate and carried out by a mechanical mixer. The coat shall be used only within the limits of its pot-life and shall be discharged before the pot-life time has expired. The pot-life of any coat is specified in product data sheet.
Coating application shall be carried out only at the following conditions:
- Air temperature: 5 ÷ 40 °C. Min value of 10 °C for two components catalyzes coats
- Air relative humidity: < 85%. Min value of 50% for zinc primer application
- Steel temperature: at least 3 °C above the dew point temperature of the surrounding air
- Max steel temperature during application: 40 °C, unless a different value is declared in writing by Coat Manufacturer

Temperature and humidity shall be continuously monitored.
Primer application shall be performed before any visible rusting occurs and within maximum 4 hours from surface preparation. Should the surface be contaminated prior to coating, the surface shall be restored before primer application.
The primer shall be applied on the welds only after completion of all required pressure testing unless allowed by mechanical code.
Coating application shall be carried out, preferably, by airless spray.
Stripe coating method, by brush or roller, shall be applied on all the areas difficult to reach such as: welds, bolts holes, corners, edges, etc. Stripe coating is requested for each layer of coating.
Intermediate and/or finish coating application shall be performed only if the previous coat is in perfect condition.
The application of the whole coating system shall occur without sag, runs, blistering, wrinkling and spots. The color shade and the gloss shall be even. Each coat shall have a different color from the previous one, to prevent uncoated areas and to facilitate inspection. The min dry film thickness shall suit to the requested value. The max dry film thickness shall suit to the value indicated in the product data sheet of the product.

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5 INSPECTION SAND ACCEPTANCE CRITERIA

The following tables shows a guideline for planning the inspection test of coating process and the quality control (where applicable).

Test type	Method	Frequency	Acceptance criteria	Consequence
Visual examination	Visual for sharp edges weld spatter slivers, rust grade EN ISO 8501-3	100% of all surfaces	P2 extensive preparation: the surface is free from significant visible imperfections. Where defects are noted on pressure retaining equipment such as pipe work, these items shall be quarantined, and the CONTRACTOR advised prior to repair	Defects to be repaired
Cleanliness	a) ISO 8501-1 b) ISO 8502-3	a) 100% visual of all surface b) Spot checks	a) The required blast standard shall be minimum SA 2.5 for all coating systems b) Maximum quantity and size rating 2	a) Reblasting b) Recleaning and retesting until acceptable
Salt test	The ISO 8502-9 method shall used	Test shall be carried out on each fabricated item	Maximum conductivity corresponding to 20 mg/m2 NaCl	Repeated washing with potable water and retesting until acceptance
Roughness	Comparator, stylus instrument (preferred) or tester tape (ISO 8503) Surface profile comparators in accordance with ISO8501-2 may be used but only as an inspection tool to supplement DFT measurements.	Each component or once per 10 m2	As specified	Reblasting
Visual examination of coating	Visual to determine curing, contamination, solvent retention, Pinholes/popping, sagging and surface defects	100 % of surface after each coat	According to specified requirements	Repair of defects

Test type	Method	Frequency	Acceptance criteria	Consequence
Film thickness	ISO 19840 calibration on a smooth surface. Measurement of DFT reading on non magnetic (e.g. DSS) surfaces shall be subjected to agreement with COMPANY. Supplier shall select suitable instrument and demonstrate accuracy of readings (against precision foils and against test plate and micrometer)	ISO 19840	ISO 19840and coating system data sheet	Repair, additional coats or recoating as appropriate

6 PAINTING SPECIFICATION TABLES

6.1.1 Container External Surface

Unit		WATER TREATMENT PACKAGE
Part(s)		Container Surface
Applicable Paint System		System 1
Material		Ferritic Steel
Operating Temperature		-8C° to 25°C not insulated
New		
Surface	Methods	Dry abrasive grit blasting
	Applicable Standard	Sa 2 ½ (SSPC-SP10)
	Profile	As per Product datasheet
Primer	Product Type	Epossidic Zinc Primer
	Product Manufacturer / Name	PPG / SIGMAZINC 102 HS
	Color	N.A.
	Dry Film Thickness [µm]	60 µm
Intermediate Coat	Product Type	High Build Epoxy
	Product Manufacturer / Name	PPG / SIGMACOVER 350
	Color	-
	Dry Film Thickness [µm]	100 µm (minimum)
Top Coat	Product Type	Chlorinated rubber or Acrylic top coat
	Product Manufacturer / Name	PPG / SIGMADUR 550
	Color	RAL 7035
	Dry Film Thickness [µm]	40 µm (minimum)

Maintenance (Touch-up)		
Surface	Methods	Dry abrasive grit blasting
	Applicable Standard	Sa 2 ½ (SSPC-SP10)
	Profile	As per Product datasheet
Primer	Product Type	Epossidic Zinc Primer
	Product Manufacturer / Name	PPG / SIGMAZINC 102 HS
	Color	N.A.
	Dry Film Thickness [µm]	60 µm
Intermediate Coat	Product Type	High Build Epoxy
	Product Manufacturer / Name	PPG / SIGMACOVER 350
	Color	-
	Dry Film Thickness [µm]	100 µm (minimum)
Top Coat	Product Type	Chlorinated rubber or Acrylic top coat
	Product Manufacturer / Name	PPG / SIGMADUR 550
	Color	RAL 7035
	Dry Film Thickness [µm]	40 µm (minimum)

NOTE:

1) The following surface will be not painted:
   - Stainless steel and Super Duplex surface
   - PVC-U, GRP or PP surface
2) Bolts nuts screw used for equipment or piping assembling will be HDG
3) Technical data sheet of the selected product will be filled in upon selected by painter.
   The selected product shall be approved before proceeding.

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SIGMAZINC™ 102 HS

DESCRIPTION

Two-component, high solids polyamide cured zinc rich epoxy primer

PRINCIPAL CHARACTERISTICS

- High build anticorrosive zinc epoxy primer
- Designed as a system primer for various paint systems
- Quick-drying, can be overcoated after a short interval
- Complies with the compositional requirements of SSPC-Paint 20, Level 3

COLOR AND GLOSS LEVEL

- Gray, redbrown
- Flat

BASIC DATA AT 20°C (68°F)

Data for mixed product	
Number of components	Two
Mass density	2.4 kg/l (20.0 lb/US gal)
Volume solids	66 ± 2%
VOC (Supplied)	Directive 2010/75/EU, SED: max. 120.0 g/kg max. 286.0 g/l (approx. 2.4 lb/US gal) China GB 30981-2020 (tested) 316.0 g/l (approx. 2.6 lb/gal)
Recommended dry film thickness	60 - 150 µm (2.4 - 6.0 mils) depending on system
Theoretical spreading rate	11.0 m^2/l for 60 µm (441 ft^2/US gal for 2.4 mils)
Dry to touch	2 hours
Overcoating Interval	Minimum: 6 hours Maximum: 3 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

RECOMMENDED SUBSTRATE CONDITIONS AND TEMPERATURES

Immersion exposure

- Steel; shot 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

SIGMAZINC™ 102 HS

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; sweep blasted to SPSS-Ss or power tool cleaned to SPSS-Pt3

Substrate temperature and application conditions

- 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

None

Pot life

8 hours at 20°C (68°F)

Air spray

Recommended thinner

THINNER 91-92

Volume of thinner

5 - 15%, depending on required thickness and application conditions

Nozzle orifice

1.8 – 2.2 mm (approx. 0.070 – 0.087 in)

Nozzle pressure

0.3 - 0.6 MPa (approx. 3 - 6 bar; 44 - 87 p.s.i.)

SIGMAZINC™ 102 HS

Airless spray

Recommended thinner
THINNER 91-92

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

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

Nozzle pressure
15.0 MPa (approx. 150 bar; 2176 p.s.i.)

Brush/roller

Recommended thinner
THINNER 91-92

Volume of thinner
0 – 10%

Cleaning solvent
THINNER 90-53

ADDITIONAL DATA

Spreading rate and film thickness	
DFT	**Theoretical spreading rate**
60 µm (2.4 mils)	11.0 m^2/l (441 ft^2/US gal)
75 µm (3.0 mils)	8.8 m^2/l (353 ft^2/US gal)
100 µm (4.0 mils)	6.6 m^2/l (265 ft^2/US gal)
150 µm (6.0 mils)	4.4 m^2/l (176 ft^2/US gal)

Overcoating interval for DFT up to 100 µm (4.0 mils)					
Overcoating with...	**Interval**	**10°C (50°F)**	**20°C (68°F)**	**30°C (86°F)**	**40°C (104°F)**
subsequent coating	Minimum	10 hours	6 hours	4 hours	3 hours
	Maximum	3 months	3 months	3 months	3 months

Notes:
- Zinc rich primers can form zinc salts on the surface; preferably they should not be weathered for long periods before overcoating
- An interval of several months can be allowed under clean interior exposure conditions
- Before overcoating any visible surface contamination must be removed by high-pressure water cleaning, sand washing, sweep blasting or mechanical cleaning

SIGMAZINC™ 102 HS

Curing time for DFT up to 100 µm (4.0 mils)			
Substrate temperature	**Dry to touch**	**Dry to handle**	**Full cure**
10°C (50°F)	5 hours	6 hours	20 days
15°C (59°F)	3 hours	4 hours	10 days
20°C (68°F)	2 hours	3 hours	7 days
30°C (86°F)	1 hour	1.5 hours	5 days

Note: Adequate ventilation must be maintained during application and curing

SAFETY PRECAUTIONS

- See Safety Data Sheet and product label for complete safety and precaution requirements
- 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

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SIGMACOVER™ 350

DESCRIPTION

Two-component, high-build polyamide cured epoxy primer/coating based upon pure epoxy technology

PRINCIPAL CHARACTERISTICS

- Surface tolerant primer/coating for wide use in Marine and Protective Coatings
- Marine use: suitable on topsides, decks, superstructures and cargo holds
- Excellent corrosion resistance
- Compatible with various aged coatings
- Suitable as floor coating for pedestrian traffic with dry to walk on time of 6 hours at 20°C (68°F)
- Good impact and abrasion resistance
- Smooth film, easy to clean
- Resistant to splash and spillage of a wide range of chemicals

COLOR AND GLOSS LEVEL

- Standard and custom colors, including aluminum
- For Cargo holds gray (5177) and redbrown (6179) only
- Semi-gloss

Notes:

- Epoxy coatings will chalk and fade upon exposure to sunlight, elevated temperatures, or chemical exposure. Discoloration and normal chalking do not impact performance. Light colors will darken over time. Some batch-to-batch variation in color is to be expected. Color matches are approximate.
- The addition of a UV stable topcoat should be considered when using epoxy coatings in cosmetic areas

BASIC DATA AT 20°C (68°F)

Data for mixed product	
Number of components	Two
Mass density	1.4 kg/l (11.7 lb/US gal)
Volume solids	72 ± 2%
VOC (Supplied)	Directive 2010/75/EU, SED: max. 263.0 g/kg max. 361.0 g/l (approx. 3.0 lb/US gal) China GB 30981-2020 (tested) 299.0 g/l (approx. 2.5 lb/gal)
Recommended dry film thickness	100 - 150 µm (4.0 - 6.0 mils) for airless spray
Theoretical spreading rate	5.8 m^2/l for 125 µm (231 ft^2/US gal for 5.0 mils) 4.8 m^2/l for 150 µm (192 ft^2/US gal for 6.0 mils)
Dry to touch	2 hours
Overcoating Interval	Minimum: 6 hours See overcoating tables
Full cure after	7 days

SIGMACOVER™ 350

Data for mixed product	
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

RECOMMENDED SUBSTRATE CONDITIONS AND TEMPERATURES

Substrate conditions

- Steel; blast cleaned to ISO-Sa2½ for excellent corrosion protection, blasting profile 40 – 70 µm (1.6 – 2.8 mils)
- Steel; blast cleaned to ISO-Sa2, blasting profile 40 – 70 µm (1.6 – 2.8 mils) or power tool cleaned to minimum ISO-St2 for good corrosion protection
- Coated steel; hydrojetted to VIS WJ2/3L
- Surface must be dry and free from any contamination
- Existing sound epoxy systems and most sound alkyd coating system; sufficiently roughened

Substrate conditions of concrete for thinned version

- Dried for at least 28 days in good ventilation conditions
- Moisture content should not exceed 4.5%
- Concrete must be sound, dry, free from laitance and any contamination
- Rough surface; eventually abraded by power tool or diamond abrading tool

Coated concrete

- Existing sound coating systems; sufficiently roughened, dry and cleaned
- To ensure compatibility, rub the existing coating with a cloth with Xylene or MEK for 10 seconds, and remove existing coatings if dissolving occurs
- Rough surface; eventually abraded by power tool or diamond abrading tool

Substrate temperature and application conditions

- 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

SYSTEM SPECIFICATION

- SIGMACOVER 350: 2 x 125 µm (5.0 mils) DFT

SIGMACOVER™ 350

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
- Thinner should be added after mixing the components

Induction time

None

Pot life

3 hours at 20°C (68°F)

Note: See ADDITIONAL DATA – Pot life

Air spray

Recommended thinner

THINNER 91-92

Volume of thinner

5 - 10%, depending on required thickness and application conditions

Nozzle orifice

1.8 – 2.0 mm (approx. 0.070 – 0.079 in)

Nozzle pressure

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

Airless spray

Recommended thinner

THINNER 91-92

Volume of thinner

0 - 5%, depending on required thickness and application conditions

Nozzle orifice

Approx. 0.48 – 0.53 mm (0.019 – 0.021 in)

Nozzle pressure

15.0 MPa (approx. 150 bar; 2176 p.s.i.)

SIGMACOVER™ 350

Brush/roller

Recommended thinner
THINNER 91-92

Volume of thinner
0 – 5%

Note: 10 - 15% when applied as a primer direct to concrete

Cleaning solvent
THINNER 90-53

ADDITIONAL DATA

Spreading rate and film thickness	
DFT	**Theoretical spreading rate**
100 µm (4.0 mils)	7.2 m^2/l (289 ft^2/US gal)
125 µm (5.0 mils)	5.8 m^2/l (231 ft^2/US gal)
150 µm (6.0 mils)	4.8 m^2/l (192 ft^2/US gal)

Note: Maximum DFT when brushing: 100 µm (4.0 mils)

Overcoating interval for DFT up to 150 µm (6.0 mils) For application in atmospheric exposure and industrial PC						
Overcoating with...	**Interval**	**5°C (41°F)**	**10°C (50°F)**	**20°C (68°F)**	**30°C (86°F)**	**40°C (104°F)**
itself and various two-pack epoxy coatings	Minimum Maximum	16 hours Extended	9 hours Extended	6 hours Extended	4 hours Extended	3 hours Extended
polyurethanes	Minimum Maximum	48 hours 6 months	30 hours 5 months	18 hours 2.5 months	9 hours 1.5 months	5 hours 14 days
various single pack coatings (such as alkyds and acrylics)	Minimum Maximum	24 hours 14 days	24 hours 14 days	16 hours 14 days	8 hours 7 days	5 hours 4 days

Notes:
- Actual maximum overcoating times will be influenced by local conditions
- A detergent wash with PREP 88 or equivalent is recommended prior to application of topcoats after 30 days of exposure if chalking or contamination is present
- To ensure optimal adhesion of the next coat, the surface must be dry and free from all contaminations (oil, grease, chalking, etc...) which would require cleaning and/or abrading

SIGMACOVER™ 350

Overcoating interval for DFT up to 150 µm (6.0 mils) For application in cargo holds, on decks and marine areas subject to non-permanent splash and spillage of seawater and/or chemicals						
Overcoating with...	**Interval**	**5°C (41°F)**	**10°C (50°F)**	**20°C (68°F)**	**30°C (86°F)**	**40°C (104°F)**
itself and various two-pack epoxy coatings	Minimum	16 hours	9 hours	6 hours	4 hours	3 hours
	Maximum	1 month	1 month	21 days	14 days	7 days
polyurethanes	Minimum	48 hours	30 hours	18 hours	9 hours	5 hours
	Maximum	1 month	21 days	14 days	7 days	3 days

Curing time for DFT up to 150 µm (6.0 mils)			
Substrate temperature	**Dry to touch**	**Dry to handle**	**Full cure**
5°C (41°F)	12 hours	16 hours	25 days
10°C (50°F)	6 hours	9 hours	15 days
20°C (68°F)	2 hours	6 hours	7 days
30°C (86°F)	1 hour	4 hours	4 days
40°C (104°F)	1 hour	3 hours	48 hours

Notes:

- For cargo hold application: for full cure for hard angular cargoes, please contact your nearest PPG Protective & Marine Coatings sales office
- Adequate ventilation must be maintained during application and curing
- Should SIGMACOVER 350 or the total coating system (2 x 125 µm/2 x 5.0 mils) be applied in excess of the specified dry film thickness, then the time necessary to reach full cure will be increased

Pot life (at application viscosity)	
Mixed product temperature	**Pot life**
15°C (59°F)	4 hours
20°C (68°F)	3 hours
30°C (86°F)	2 hours
40°C (104°F)	1 hour

SAFETY PRECAUTIONS

- See Safety Data Sheet and product label for complete safety and precaution requirements
- 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.

SIGMACOVER™ 350

REFERENCES

- EXPLANATION TO PRODUCT DATA SHEETS INFORMATION SHEET 1411

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

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.

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SIGMADUR™ 550

DESCRIPTION

Two-component, aliphatic acrylic polyurethane finish

PRINCIPAL CHARACTERISTICS

- Unlimited recoatable
- Excellent resistance to atmospheric exposure conditions
- Good color and gloss retention
- 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

Note: Certain colors, especially red, orange, and yellow may require additional coats for adequate hiding, especially if applied over primers with a significant color contrast

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 2010/75/EU, SED: max. 334.0 g/kg EUR Directive: 2004/42/IIA(i)(500) 459 g/l max. 430.0 g/l (approx. 3.6 lb/US gal) China GB 38469-2019 (tested) 409.0 g/l (approx. 3.4 lb/gal)
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	Maximum: 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

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
- 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

- 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

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REFERENCES

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SIGMADUR™ 550

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