



Product Data

HEMPADUR® PRO 45601/ HEMPADUR® PRO 45603

45601: BASE 45609 with CURING AGENT 97330
45603: BASE 45609 with CURING AGENT 98420

Description: HEMPADUR PRO 45601/45603 is a two-component, high-build, polyamide adduct-cured epoxy paint which cures to a hard and tough abrasion resistant coating with excellent anticorrosive properties.

Recommended use: As a universal primer and self primed high performance coating system for atmospheric or in-water service. HEMPADUR 45603 is intended for use in cold/temperate climates and for in-shop applications where fast recoating and handling is required, HEMPADUR 45601 is intended for use in temperate to warm climates. For in-water service, the aluminium shade (19870) can advantageously be used as first coat.

Certificates/Approvals: Classified B1 by DNV, Norway.

Availability: Part of Group Assortment. Local availability subject to confirmation.

Features:

- Excellent anticorrosive and mechanical properties
- Broad range of use
- VOC compliant
- Short drying time
- Curing down to -10°C/14°F.

Service temperatures:

Dry exposure only:	Maximum 140°C/284°F (See REMARKS overleaf)
Ballast water service:	Resists normal ambient temperatures at sea*.
Other water service:	40°C/104°F (no temperature gradient)
Other liquids:	Contact HEMPEL

*Avoid long-term exposure to negative temperature gradients.

PHYSICAL CONSTANTS:

Version; mixed product:	45601	45603
Colours/Shade nos:	Grey 12170*	Grey 12170*
Finish:	Semi-flat	Semi-flat
Volume solids, %:	65 ± 1	65 ± 1
Theoretical spreading rate:	4.3 m ² /litre - 150 micron 174 sq.ft./US gallon - 6 mils	4.3 m ² /litre - 150 micron 174 sq.ft./US gallon - 6 mils
Flash point:	32°C/90°F	32°C/90°F
Specific gravity:	1.3 kg/litre - 11.7 lbs/US gallon	1.3 kg/litre - 11.7 lbs/US gallon
Dry to touch:	7 hours (app.) at 20°C/68°F	16 hours (app.) at 5°C/41°F
Fully cured:	7 days at 20°C/68°F	20 days at 5°C/41°F
V.O.C.:	310 g/litre - 2.6 lbs/US gallon	305 g/litre - 2.5 lbs/US gallon

*) See REMARKS overleaf

The physical constants stated are nominal data according to the HEMPEL Group's approved formulas. They are subject to normal manufacturing tolerances and where stated, being standard deviation according to ISO 3534-1.

APPLICATION DETAILS:

Mixing ratio:	45601 Base 45609 : Curing agent 97330 4 : 1 parts by volume	45603 Base 45609 : Curing agent 98420 4 : 1 parts by volume
Application method:	Airless spray Brush	Airless spray Brush
Thinner (max.vol.):	08450 (5%) 08450 (5%)	08450 (5%) 08450 (5%)
Pot life:	2 hours (20°C/68°F)	2 hours (20°C/68°F)
Induction time:	See REMARKS overleaf	
Nozzle orifice:	.021"-.025"	
Nozzle pressure:	250 bar/3600 psi (Airless spray data are indicative and subject to adjustment)	
Cleaning of tools:	HEMPEL'S TOOL CLEANER 99610	
Indicated film thickness, dry:	150 micron/6 mils (See REMARKS overleaf)	
Indicated film thickness, wet:	225 micron/9 mils	
Recoat interval, min:	See separate APPLICATION INSTRUCTIONS	
Recoat interval, max:	See separate APPLICATION INSTRUCTIONS	

Safety: Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult HEMPEL Material Safety Data Sheets and follow all local or national safety regulations. Avoid inhalation, avoid contact with skin and eyes, and do not swallow. Take precautions against possible risks of fire or explosions as well as protection of the environment. Apply only in well ventilated areas.



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SURFACE PREPARATION:	<p>New steel: When used as an intermediate or finishing coat please refer to the data sheet for the preceding GALVOSIL or HEMPADUR primer. When used as a primer please refer to the specification.</p> <p>Ballast tanks: For PSPC type approved coating, consult separate APPLICATION INSTRUCTIONS - BALLAST TANKS for HEMPADUR PRO 45601/45603.</p> <p>Zinc silicate painted or spray-metallized surfaces: Remove oil and grease, etc. with suitable detergent. Remove salt and other contaminants by (high pressure) fresh water cleaning. Zinc salts (white rust) must be removed by high pressure hosing combined with rubbing with a stiff nylon brush if necessary. It is recommended to recoat spray-metallized surfaces as soon as possible to avoid possible contamination.</p> <p>Concrete: Remove slip agent and other possible contaminants by emulsion washing followed by high pressure hosing with fresh water. Remove scum layer and loose matter to a hard, rough and uniform surface, preferably by abrasive blasting, possibly by other mechanical treatment or acid etching. Seal surface with suitable sealer e.g. HEMPADUR SEALER 05990, as per relevant painting specification.</p> <p>Major refurbishment of steel: Remove oil and grease, etc. with suitable detergent. Remove salt and other contaminants by (high pressure) fresh water cleaning. Clean damaged areas thoroughly by abrasive blasting to min. Sa 2½. As an alternative to dry cleaning, water jetting may be employed. When water-jetting to bare steel the degree of cleaning shall be min. Wa 2½ (ISO 8501-4:2006). A flash-rust degree of maximum M for atmospheric exposure and M, preferably L for immersion service (ISO 8501-4:2006) is acceptable.</p>
APPLICATION CONDITIONS:	<p>Use only where application and curing can proceed at temperatures above -10°C/14°F (curing agent 98420) and 0°C/32°F (curing agent 97330). The temperature of the paint itself should be above 15°C/59°F for proper application. Apply only on a dry and clean surface with a temperature above the dew point to avoid condensation.</p> <p>In confined spaces provide adequate ventilation during application and drying.</p>
SUBSEQUENT COAT:	None or according to specification.
REMARKS:	
Weathering/ service temperatures:	The natural tendency of epoxy coatings to chalk in outdoor exposure and to become more sensitive to mechanical damage and chemical exposure at elevated temperatures is also reflected in this product.
Film thicknesses:	May be specified in another film thickness than indicated depending on purpose and area of use. This will alter spreading rate and may influence drying time and recoating interval. Normal range dry is 125-200 micron/5-8 mils.
Shades:	Other shades including a MIO-pigmented, is available according to assortment list. The aluminium pigmented version 19870 is designed for primer-coat application, holds same volume solids (65%), but has a slightly higher VOC (340 g/litre - 2.8 lbs/US gallon) than the other shades.
Curing agent: Mixing/ induction time:	Curing agent 98420 is hazy. This is intended and has no negative influence on performance. To facilitate proper application properties it is recommended to allow the thoroughly mixed BASE and CURING AGENT to pre-react before application. In case two-component spray-equipment is used, consult separate APPLICATION INSTRUCTIONS.
Application onto zinc silicate or spray-metallized surfaces (thinning):	It is recommended to apply HEMPADUR PRO 45601/45603 by using a "mist-coat" procedure: A thin coat is applied (the mist coat) and after a few minutes, a second coat is applied in the full specified film thickness. Depending on actual conditions of application, such as temperature, porosity of substrate, method of spray, thinning (up to 50%) may be required.
Note:	HEMPADUR PRO 45601/45603 is for professional use only.
ISSUED BY:	HEMPEL A/S - 4560112170CS002 / 4560312170CS002

This Product Data Sheet supersedes those previously issued.

For explanations, definitions and scope, see "Explanatory Notes" in the HEMPEL Book.

Data, specifications, directions and recommendations given in this data sheet represent only test results or experience obtained under controlled or specially defined circumstances. Their accuracy, completeness or appropriateness under the actual conditions of any intended use of the Products herein must be determined exclusively by the Buyer and/or User.

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Product data are subject to change without notice and become void five years from the date of issue.



Application Instructions

For product description refer to product data sheet

HEMPADUR® PRO 45601/ HEMPADUR® PRO 45603

45601: BASE 45609 with CURING AGENT 97330

45603: BASE 45609 with CURING AGENT 98420

Scope: These Application Instructions cover surface preparation, application equipment and application details for HEMPADUR PRO 45601/45603.

Surface preparation: **General:** In order to obtain best performance, abrasive blast cleaning is recommended.

Remove oil and grease with suitable detergent, salt and other contaminants by (high pressure) fresh water cleaning.

Waterjetting:

As an alternative to dry blasting in relation to major refurbishment, waterjetting may be employed. By water jetting to steel, cleanliness shall be min. Wa 2½ (ISO 8501-4:2006). A flash-rust degree of maximum M (atmospheric exposure) / M, preferably L (immersion) (ISO 8501-4:2006) is acceptable before application.

When used for immersion service:

Abrasive blasting to Sa 2½. After abrasive blasting, clean the surface carefully from abrasives and dust. For temporary protection, if required, use suitable shopprimer. All damage to shopprimer and contamination from storage and fabrication should be thoroughly cleaned prior to final painting.

Stainless steel: to be abrasive blasted to a uniform, sharp, dense profile, ISO Comparator Medium (G), corresponding to Rz minimum 50 micron. Any salts, grease, oil, etc. to be removed before abrasive blasting is commenced.

Note: On old steel surfaces having been exposed to salt water, excessive amounts of salt residues in pittings may call for high pressure water jetting, wet abrasive blasting, alternatively dry abrasive blasting, high pressure fresh water hosing, drying, and finally, dry abrasive blasting again.

Application equipment: HEMPADUR PRO 45601/45603 being a high viscosity material, may require special measures to be taken at application.

Recommended airless spray equipment:

Pump ratio:	min 45:1
Pump output:	12 litres/minute (theoretical)
Input pressure:	min. 6 bar/90 psi
Spray hoses:	max. 100 metres/300 feet, ½" internal diameter max. 30 metres/100 feet, 3/8" internal diameter max. 6 metres/20 feet, 1/4" internal diameter
Filter:	60 mesh
Nozzle size:	.021"-.025"
Fan angle:	60-80°.

To spray complicated surfaces smallest nozzles should be used.

After finishing the application, clean the equipment immediately with HEMPEL'S TOOL CLEANER 99610.

Note: Increasing hose diameter may ease paint flow thereby improving the spray fan. If longer hoses are necessary it may be necessary to raise the pump ratio to 60:1, maintaining the high output capacity of the pump.

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Alternatively up to approximately 5% THINNER 08450 may be added, but thinning must be done with care as the maximum obtainable film thickness is reduced significantly by over thinning.

Airless spray data are indicative and subject to adjustment

Application:

Film-build/continuity: for high performance paint specifications it is of special importance that a continuous, pinhole-free paint film is obtained at application of each coat. An application technique which will ensure good film formation on **all** surfaces must be adopted. It is very important to use nozzles of the correct size, not too big, and to have a proper, uniform distance of the spray gun to the surface, 30-50 cm should be aimed at. Furthermore, great care must be taken to cover edges, openings, rear sides of stiffeners etc. Thus, on these areas a stripe coat will usually be necessary. To obtain good and steady atomising, the viscosity of the paint must be suitable and the spray equipment must be sufficient in output pressure and capacity. At high working temperatures, use of extra thinner may be necessary to avoid dust-spray.

The paint layer must be applied homogeneously and as close to the specification as possible. Avoid exaggerated film thickness due to the risk of sagging, cracks and solvent retention. The paint consumption must be controlled.

The finished coating must appear as a homogeneous film with a smooth surface and irregularities such as dust, dry spray, abrasives, should be remedied.

Stripe coating: may either be applied by airless spray, (relatively small, narrow-angled nozzles) or by hand-tools. Apply the stripe coat as a uniform, regular film without excessive brush or roller marks in order to avoid cratering by entrapped air.

First coat on steel substrates: HEMPADUR PRO 45601/3 in shade 19870 (Grey Alu) is recommended as first coat when the product is applied directly to steel substrates - independent of method of surface preparation.

Application on zinc silicate or spray metallised surfaces:

A proper mist-coat technique is necessary in order to avoid/reduce the risk of "popping"/"pinholes". Add up to 50% thinner depending on the actual conditions of application.

Pot life/mixing/induction time (both curing agents):

When measured under standard conditions the pot life is 3 hours at 15°C/59°F and 2 hours at 20°C/68°F. However, for a 20 litres/5 US gallons mix, the heat developed by the chemical reaction between BASE and CURING AGENT may make the corresponding practical pot life shorter.

- Mix the entire content of corresponding base and curing agent packing. If it is necessary to mix smaller portions, this must be done properly by either weighing base and curing agent in the prescribed weight ratio: 86 parts by weight of base and 14 parts by weight of curing agent or by volume: 4.0 parts by volume base and 1.0 parts by volume curing agent.
- Stir the mixed paint thoroughly by means of a clean mechanical mixer until a homogeneous mixture is obtained.
- Use all mixed paint before the pot life is exceeded. The pot life depends on the temperature of the paint as shown in table below (valid for a 20 litres can):

Temperature of mixed paint	15°C/59°F ¹⁾	20°C/68°F	25°C/77°F	30°C/86°F ²⁾
Pot life	3 hours	2 hours	1½ hours	1 hour

1) At 15°C/59°F and below, the viscosity can be too high for airless spray application.

2) Temperatures above 30°C/86°F should preferably be avoided.

Induction time:

At **steel** temperatures below 5°C/41°F the paint may advantageously be pre reacted 10-20 minutes before spray application (longer pre-reaction time at lower temperatures).



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When two-component spray equipment is used, heating may be relevant to obtain a proper spray fan and a uniform and smooth paint film. This can either be done by preheating the two-component paint or by using a flow-heater on the pressure side. As an indication, a paint temperature of approx 40°C/104°F will be relevant, but has to be adjusted according to the actual conditions.

Safety:

Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult HEMPEL Material Safety Data Sheets and follow all local or national safety regulations. Avoid inhalation, avoid contact with skin and eyes, and do not swallow. Take precautions against possible risks of fire or explosions as well as protection of the environment. Apply only in well ventilated areas.

ISSUED BY:

HEMPEL A/S - 4560119870CR001/4560319870CR001

Attached:

Tables of "physical data versus temperature"

In relation to recoating intervals the following is very important:

Maximum recoating intervals:

If the maximum recoating interval is exceeded, whatever the subsequent coat, roughening of the surface is necessary to ensure optimum intercoat adhesion or in the case of recoating with coatings other than HEMPADUR, apply a (thin) additional coat of HEMPADUR PRO 45601/45603 within the following directions for recoating:

- **Long recoating intervals:**

A completely clean surface is mandatory to ensure intercoat adhesion, especially in the case of long recoating intervals. Any dirt, oil and grease have to be removed with eg suitable detergent followed by high pressure fresh water cleaning. Salts to be removed by fresh water hosing.

- **Any degraded surface layer, as a result of a long exposure period, must be removed as well.** Water jetting may be relevant to remove any degraded surface layer and may also replace the above-mentioned cleaning methods when properly executed. Consult HEMPEL for specific advice if in doubt.

To check whether the quality of the surface cleaning is adequate, a test patch may be relevant.

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Physical data versus temperature:

(HEMPADUR PRO 45601 in a dry film thickness of 150 micron/6 mils):

Surface temperature	0°C/32°F	10°C/50°F	20°C/68°F	30°C/86°F	40°C/104°F
Drying time	32 hours	14 hours	7 hours	5 hours	3 hours
Curing time	28 days	14 days	7 days	3½ days	2 days
Initial curing	20 days	10 days	5 days	2½ days	1½ days

(HEMPADUR PRO 45603 in a dry film thickness of 150 micron/6 mils):

Surface temperature	-10°C/14°F	0°C/32°F	10°C/50°F	20°C/68°F	30°C/86°F
Drying time	45 hours	23 hours	10 hours	5 hours	4 hours
Curing time	56 days	28 days	14 days	7 days	3½ days
Initial curing	40 days	20 days	10 days	5 days	2½ days

Recoating:

Recoating intervals (provided proper ventilation)

(HEMPADUR PRO 45601 in a dry film thickness of 150 micron/6 mils):

Surface temperature	10°C/50°	20°C/68°F	30°C/86°F
MINIMUM recoating interval related to later conditions of exposure:			
Interval for recoating with 58030			
Atmospheric, medium	24 hours	12 hours	6 hours
Atmospheric, severe	24 hours	12 hours	6 hours
Interval for recoating with HEMPADUR, HEMPATHANE and HEMPAXANE qualities			
Atmospheric, medium	12 hours	6 hours	4 hours
Atmospheric, severe	14 hours	7 hours	5 hours
Immersion*	16 hours	8 hours	5 hours
MAXIMUM recoating interval related to later conditions of exposure:			
Interval for recoating with 58030			
Atmospheric Medium	6 days	3 days	36 hours
Severe	3 days	1½ days	18 hours
Interval for recoating with HEMPADUR qualities			
Atmospheric, medium	None	None	None
Atmospheric, severe	None	None	None
Immersion**	90 days	30 days	15 days
Interval for recoating with HEMPATHANE qualities			
Atmospheric, medium	20 days	10 days	5 days
Atmospheric, severe	6 days	3 days	36 hours
Immersion	Not relevant	Not relevant	Not relevant
Interval for recoating with HEMPAXANE qualities			
Atmospheric, medium	60 days	30 days	15 days
Atmospheric, severe	42 days	21 days	10 days
Immersion	Not relevant	Not relevant	Not relevant

* Only relevant for HEMPADUR qualities.

** Depending on actual local conditions, extended maximum recoating intervals may apply. Please contact HEMPEL for further advice.

Furthermore, please see page 3.



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Physical data versus temperature Infield application:

(HEMPADUR PRO 45603 in a dry film thickness of 150 micron/6 mils):

Surface temperature	-10°C/14°F	0°C/32°F	10°C/50°F	20°C/68°F
MINIMUM recoating interval related to later conditions of exposure:				
Interval for recoating with 58030				
Atmospheric, medium	Not relevant	Not relevant	16 hours	8 hours
Atmospheric, severe	Not relevant	Not relevant	16 hours	8 hours
Interval for recoating with HEMPADUR, HEMPATHANE qualities and HEMPAXANE qualities				
Atmospheric, medium	36 hours	18 hours	8 hours	4 hours
Atmospheric, severe	45 hours	23 hours	10 hours	5 hours
Immersion*	54 hours	27 hours	12 hours	6 hours
MAXIMUM recoating interval related to later conditions of exposure:				
Interval for recoating with 58030				
Atmospheric, medium	Not relevant	Not relevant	6 days	3 days
Atmospheric, severe	Not relevant	Not relevant	3 days	1½ days
Interval for recoating with HEMPADUR qualities				
Atmospheric, medium	None	None	None	None
Atmospheric, severe	None	None	None	None
Immersion**	(90 days)	90 days	60 days	30 days
Interval for recoating with HEMPATHANE qualities				
Atmospheric, medium	90 days	45 days	20 days	10 days
Atmospheric, severe	30 days	15 days	6 days	3 days
Interval for recoating with HEMPAXANE qualities				
Atmospheric, medium	Not relevant	90 days	60 days	30 days
Atmospheric, severe	Not relevant	60 days	42 days	21 days

* Not relevant for HEMPATHANE qualities.

** Depending on actual local conditions, extended maximum recoating intervals may apply. Please contact HEMPEL for further advice.

Furthermore, please see page 3.

Workshop application:

For Workshops managing strict consumption control and equipped with proper ventilation, minimum recoat interval may be reduced for HEMPADUR PRO 45603:

(125 micron/5 mils dry film thickness of HEMPADUR PRO 45603)

Surface temperature	10°C/50°F	20°C/68°F	30°C/86°F
MINIMUM Interval for recoating with HEMPADUR and HEMPATHANE qualities			
Atmospheric, medium	4 hours	2 hours	1½ hours
Atmospheric, severe	4 hours	2 hours	1½ hours



Application Instructions

BALLAST TANKS

For product description refer to product data sheet

HEMPADUR PRO 45601/ HEMPADUR PRO 45603

45601: BASE 45609 with CURING AGENT 97330
45603: BASE 45609 with CURING AGENT 98420

Scope:

These Application Instructions cover surface preparation, application equipment and application details for HEMPADUR PRO 45601/45603 when applied in ballast tanks according to the requirements in IMO Resolution MSC.215(82): Performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers (PSPC). The Applications Instructions are applicable also for vessels not covered by PSPC.

Ballast tanks, steel work:

The steel shall preferably be Rust Grade A or B according to ISO 8501-1. The use of steel with Rust Grade C requires more tight inspection of surface profile after blasting as well as of possible salt contamination.

The steel surface shall be prepared so that the coating achieves an even distribution at the specified nominal dry film thickness of 320 micron and has an adequate adhesion by removing sharp edges, grinding weld beads and removing weld spatter and any other surface contamination. PSPC makes reference to ISO 8501-3: "Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness".

For optimum performance the following is recommended: All welding seams shall be partially dressed to remove irregular profiles.

Surface pores, pits and craters shall be sufficiently open to allow penetration of the paint.

Sharp edges shall be treated to a rounded radius of minimum 2 mm, subjected to a three-pass grinding or treated with an equivalent process that produces an edge profile that results in a dry film thickness retention equivalent to or better than that of three pass grinding. Sharp edge means all edges except natural rounded/rolled edges of sections or profiled steel bars.

Visible roll overs/laminations shall be removed.

The surface shall be free of all loose welding spatter.

Abrasive blasting/ abrasive sweep blasting:

The coating system shall only be applied on steel primed with a pre-qualified zinc containing inhibitor free zinc silicate shopprimer according to PSPC, Table 1.2.1-3. Steel shopprimed with a shopprimer not pre-qualified must be abrasive blast cleaned to Sa 2 removing at least 70% of intact shopprimer, while steel, which has not been shopprimed must be blasted to Sa 2½.

Before blasting any deposits of grease or oil must be removed from the steel surface using a suitable detergent followed by fresh water hosing. Minor spots of oil/grease may be cleaned with thinner and clean rags - avoid smearing out the contamination. Possible alkali weld deposits, chemicals used for testing of welds, soap residues from the pressure testing must be removed by fresh water hosing.

The shopprimer must have been checked randomly for excessive film thickness. Areas detected to have film thicknesses above approx 40 micron/1.6 mils (as measured directly on the shopprimed surface with equipment calibrated on smooth steel) are to be blasted to Sa 2 removing at least 70% of the shopprimer.

Welds as well as shopprimed areas with damage, burn marks and rust must be blasted to Sa 2½.



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Welds coated with a temporary (shop) primer after welding must be cleaned by hard abrasive sweeping, preferably abrasive blasting.

Spot-checks for possible salt contamination of the surface must be executed after secondary surface preparation. The upper water soluble salts limit is 50 mg/m² sodium chloride equivalents when measured according to ISO 8502-6:2006 and ISO 8502-9:1998. To limit salt contamination from abrasives it is recommended to use abrasives showing a water-soluble contaminant level equivalent to less than 25 mS/m according to ISO 11127-6:1993.

When blasting, the importance of working systematically must be stressed. Poorly blasted areas covered with dust are very difficult to locate during the blast inspection made after the rough cleaning.

In the case of full or partial abrasive blast cleaning, the surface profile must conform to Rugotest No. 3, BN9-BN10 or Keane-Tator Comparator, 3.0 G/S or to ISO 8503-1, grade Medium (G).

Dust must be removed just before application of the paint to a dust quantity rating "1" for dust size class "3", "4" or "5". Lower dust size classes shall be removed from the surface if visible without magnification.

Note: If any doubt exists about the quality of the primary surface preparation (before shoppriming), the substrate must be re-blasted in situ as defined above.

Block assembly zones: Overlap zones must be treated with great care. Damage caused by possible over-blasting must be avoided, paint edges must be feathered and consecutive layers of paint coatings given larger and larger overlaps. Roughening must be carried out when the maximum recoating interval is exceeded (when sand papering, use free-cut paper, grain size 80).

Furthermore, these areas may be either masked off with tape - to keep them as narrow as possible. Application of a thin zinc epoxy primer coat on these areas after secondary surface preparation at block stage is acceptable if removed before the application of HEMPADUR PRO 45601/45603.

Secondary surface preparation of block assembly zones is preferably abrasive spot-blasting or mechanical cleaning to St 3. The procedure of masking off with tape or using the zinc epoxy primer as described above may advantageously be used in case of mechanical cleaning.

Stainless steel: (Ballast tanks of chemical carriers) To be abrasive blast cleaned to a uniform, sharp, dense, profile (Rugotest No. 3, BN9-10, ISO Comparator Medium (G), Keane-Tator Comparator 2.0 G/S corresponding to Rz minimum 50 micron). Any salts, grease, oil etc. shall be removed before abrasive blasting is commenced. Surface preparation and paint application to be carried out concurrently with treatment of surrounding carbon steel.

Application equipment:

HEMPADUR PRO 45601/45603, being a high viscosity material, may require special measures to be taken at application.

Recommended airless spray equipment:

Pump ratio:	min 45:1
Pump output:	12 litres/minute (theoretical)
Input pressure:	min. 6 bar/90 psi
Spray hoses:	max. 100 metres/300 feet, 1/2" internal diameter max. 30 metres/100 feet, 3/8" internal diameter max. 6 metres/20 feet, 1/4" internal diameter
Filter:	60 mesh
Nozzle size:	.021"-.025"
Fan angle:	60-80°.



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To spray complicated surfaces a smaller nozzle size should be used.

After finishing the application, clean the equipment immediately with HEMPEL'S TOOL CLEANER 99610.

Note: Increasing hose diameter may ease paint flow thereby improving the spray fan. If longer hoses are used it may be necessary to increase the pump ratio to 60:1, maintaining the high output capacity of the pump.

Alternatively up to approximately 5% THINNER 08450 may be added, but thinning must be done with care as the maximum obtainable film thickness is reduced significantly by exaggerated thinning.

Airless spray data are indicative and subject to adjustment.

Application:

PSPC requires the application of minimum two spray applied coatings and minimum two stripe coats. The relative humidity shall be 85% or below or the steel temperature shall be 3°/5°F or above the dew point.

Spray application: A continuous, pinhole-free paint film must be obtained at application of each spray applied coat. An application technique which will ensure good film formation on all surfaces must be adopted. It is very important to use nozzles of the correct size, not too large, and to have a proper, uniform distance of the spray gun to the surface, 30-50 cm should be aimed at. Furthermore, great care must be taken to cover edges, openings, rear sides of stiffeners etc. even though these areas also must be stripe coated. To obtain good and steady atomising, the viscosity of the paint must be suitable and the spray equipment must be sufficient in output pressure and capacity. At high working temperatures, use of extra thinner may be necessary to avoid dust spray.

The paint layer must be applied homogeneously and as close to the specification as possible. Care shall be taken to avoid exaggerated film thicknesses. Wet film thickness shall be regularly checked during the application.

The finished coating must appear as a homogeneous film with a smooth surface. Any defective areas, e.g. pin-holes, bubbles, voids, visible abrasive residues, shall be marked up and appropriate repair effected.

Stripe coating: The required two stripe coats must each be applied as a coherent film showing good film formation and no visible defects such as pores or un-wetted areas. The application method must ensure that all areas which require stripe coating are properly stripe coated by alternative application methods which include brush or roller. Application by airless spray requires the use of relatively small, narrow-angled nozzles. PSPC accepts that the second stripe coat, by way of welded seams only, may be reduced in scope where it is proven that the nominal dry film thickness (NDFT) can be met by the coats applied. The first stripe coating should preferably be applied after first full coat to avoid contamination of the steel substrate.

Pot life/mixing/ induction time:

When measured under standard conditions the pot life is 3 hours at 15°C/59°F and 2 hours at 20°C/68°F. However, for a 20 litres/5 US gallons mix, the heat developed by the chemical reaction between BASE and CURING AGENT may make the corresponding practical pot life shorter.

- a. Mix the entire content of corresponding base and curing agent packing. If it is necessary to mix smaller portions, this must be done properly by either weighing base and curing agent in the prescribed weight ratio: 86 parts by weight of base and 14 parts by weight of curing agent or by volume: 4.0 parts by volume base and 1.0 parts by volume curing agent.
- b. Stir the mixed paint thoroughly by means of a clean mechanical mixer until a homogeneous mixture is obtained.
- c. Use all mixed paint before the pot life is exceeded. The pot life depends on the temperature of the paint as shown in table below (valid for a 20 litres can):



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Temperature of mixed paint	15°C/59°F ¹⁾	20°C/68°F	25°C/77°F	30°C/86°F ²⁾
Pot life	3 hours	2 hours	1½ hours	1 hour

- 1) At 15°C/59°F and below, the viscosity can be too high for airless spray application.
2) Temperatures above 30°C/86°F should preferably be avoided.

Induction time:

At steel temperatures below 5°C/41°F the paint may advantageously be prereacted 10-20 minutes before spray application (longer prereaction time at lower steel temperatures).

Two-component spray equipment: Heating may be required to obtain a proper spray fan and a uniform and smooth paint film. This can either be done by preheating the two-component paint or by using a flow-heater on the pressure side. As an indication, a paint temperature of approx 40°C/104°F will be relevant, but has to be adjusted according to the actual conditions.

Dry film thickness:

PSPC requires that the nominal dry film thickness (NDFT) shall be 320 micron and achieved by minimum two spray coats and two stripe coats. The dry film thickness distribution shall be evaluated according to the 90/10 rule.

Dry film thickness (DFT)	DFT micron/mils	Remark
Minimum DFT per coat	90/3.5	Value for undiluted paint at approximately 20°C/68°F. Lower DFT may be achieved by thinning
Maximum DFT (complete coating system)	2,000/80	The maximum DFT is valid for isolated spots less than 1% of the total surface area per tank. The stated maximum DFT is for guidance and should be kept as close to the specified nominal DFT as possible. Frequent control of wet film thickness during application is recommended

Physical data versus temperature:

(HEMPADUR PRO 45601 in a dry film thickness of 160 micron/6.4 mils):

Surface temperature	0°C/32°F	10°C/50°F	20°C/68°F	30°C/86°F	40°C/104°F
Drying time	32 hours	14 hours	7 hours	5 hours	3 hours
Walk-on time	32 hours	14 hours	7 hours	5 hours	3 hours
Curing time	28 days	14 days	7 days	3½ days	2 days
Initial curing*	20 days	10 days	5 days	2½ days	1½ days

(HEMPADUR PRO 45603 in a dry film thickness of 160 micron/6.4 mils):

Surface temperature	-10°C/14°F	0°C/32°F	10°C/50°F	20°C/68°F	30°C/86°F
Drying time	45 hours	23 hours	10 hours	5 hours	4 hours
Walk-on time	45 hours	23 hours	10 hours	5 hours	4 hours
Curing time	56 days	28 days	14 days	7 days	3½ days
Initial curing*	40 days	20 days	10 days	5 days	2½ days

* When the state "initial curing" has been reached, the coating may exceptionally be exposed to ballast water provided it has been applied within the specified limits of film thicknesses and that all painted areas have been subject to thorough ventilation.

Recoating:

Recoating intervals (provided proper ventilation)
(HEMPADUR PRO 45601 in 160 micron/6.4 mils dry film thickness)

Interval	Minimum				Maximum			
	10°C/50°F	20°C/68°F	30°C/86°F	40°C/104°F	10°C/50°F	20°C/68°F	30°C/86°F	40°C/104°F
Recoating time**	17 hours	9 hours	7 hours	4 hours	60 days*	30 days*	22½ days*	15 days*

* Depending on actual local conditions, extended maximum recoating intervals may apply. Please contact HEMPEL for further advice.

** Stripe coat can be applied when it is possible to walk on the surface without damage to the coating.



Application Instructions

BALLAST TANKS

HEMPADUR PRO 45601/45603

(HEMPADUR PRO 45603 in 160 micron/6.4 mils dry film thickness)

Interval	Minimum				Maximum			
	-10°C/14°F	0°C/32°F	10°C/50°F	20°C/68°F	-10°C/14°F	0°C/32°F	10°C/50°F	20°C/68°F
Steel temperature								
Recoating time**	59 hours	29 hours	13 hours	7 hours	90 days*	90 days*	60 days*	30 days*

* Depending on actual local conditions, extended maximum recoating intervals may apply. Please contact HEMPEL for further advice.

** Stripe coat can be applied when it is possible to walk on the surface without damage to the coating.

Maximum recoating intervals:

Roughening of the surface is necessary to ensure optimum intercoat adhesion if the maximum recoating interval is exceeded.

Long recoating intervals:

A completely clean surface is mandatory to ensure intercoat adhesion, especially in the case of long recoating intervals. Any dirt, oil and grease have to be removed with eg suitable detergent followed by high pressure fresh water cleaning. Salts shall be removed by fresh water hosing.

- Any degraded surface layer, as a result of a long exposure period, must be removed as well. Water jetting may be relevant to remove any degraded surface layer and may also replace the above-mentioned cleaning methods when properly executed. Consult HEMPEL for specific advice if in doubt.

To check whether the quality of the surface cleaning is adequate, a test patch may be relevant.

8.2 Repair process

Before mechanical surface preparation is started the areas to be repaired shall be cleaned for any salts and other contamination.

Overlap zones shall be suitably prepared and coated.

Small areas: Small areas in this context are areas up to approximately A4 size (20x30 cm) or scratches of up to a few millimetres across. Cracks, in corners or at single runners, may preferably be repaired according to this method, even if they fall outside the area definition.

The surface preparation can be executed by sanding or grinding to a clean rough metal surface, feathering edges of intact coating and slightly roughening the adjacent surface and remove all dust. Touch-up with the coating material specified using stippling for the first brush coat.

Contiguous areas: Contiguous areas over 25 m²/270 sq.ft. or over 2% of the total area of the tank are to be repaired basically according to the original specification. Precautions must be taken against damage from overblasting.

Safety:

Handle with care. Before and during use, observe all safety labels on packaging and paint containers, consult HEMPEL Material Safety Data Sheets and follow all local or national safety regulations. Avoid inhalation, avoid contact with skin and eyes, and do not swallow. Take precautions against possible risks of fire or explosions as well as protection of the environment. Apply only in well ventilated areas.

ISSUED BY: HEMPEL A/S - 4560112170CS002 / 4560312170CS002

This Product Data Sheet supersedes those previously issued.

For explanations, definitions and scope, see "Explanatory Notes" in the HEMPEL Book.

Data, specifications, directions and recommendations given in this data sheet represent only test results or experience obtained under controlled or specially defined circumstances. Their accuracy, completeness or appropriateness under the actual conditions of any intended use of the Products herein must be determined exclusively by the Buyer and/or User.

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