



# Product Data

## HEMPADUR® MULTI-STRENGTH® 45751/ HEMPADUR® MULTI-STRENGTH® 45753

Medium to high temperatures: 45751: BASE 45755 with CURING AGENT 97652  
Low to medium temperatures: 45753: BASE 45755 with CURING AGENT 98750

### Description:

HEMPADUR MULTI-STRENGTH 45751/45753 is a self-priming, two-component, high-build, epoxy-polyamide/amine paint which cures to an abrasion and corrosion resistant coating. Applicable by standard heavy duty airless spray equipment.

### Recommended use:

As a heavy duty coating for areas exposed to abrasion and aggressive corrosive climate such as ramps, ship hulls and holds of bulk carriers.

As a ballast tank coating for special purposes such as chemical carriers carrying hot cargoes and other purposes where "pure epoxy coating" is requested.

As a finishing coat where a cosmetic appearance is of less importance.

HEMPADUR MULTI-STRENGTH 45751 is intended for use in warm climates.

HEMPADUR MULTI-STRENGTH 45753 is intended for use in cold climates - see APPLICATION CONDITIONS overleaf.

### 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: 50°C/122°F (no temperature gradient)

Other liquids: Contact HEMPEL

\*Avoid long-term exposure to negative temperature gradients.

### Certificates/Approvals:

Tested for non-contamination of grain cargo at the Newcastle Occupational Health, Great Britain. Approved by Lloyd's Register of Shipping as a recognized corrosion control coating. Approved as a ballast tank coating by Germanischer Lloyd, Germany.

HEMPADUR MULTI-STRENGTH 45753 has been classified B1 by DNV, Norway.

Recognized by Lloyd's Register of Shipping as a low friction surface coating for ships navigating in first year ice conditions. Conforms with Norsok M-501, system no. 7.

HEMPADUR MULTI-STRENGTH 45753 has been tested by Teknologisk Institutt AS, Norway, and approved for internal use in pipe lines for water power generation according to NS 5417.

Complies with EU Directive 2004/42/EC, subcategory j (see REMARKS overleaf).

Part of Group Assortment. Local availability subject to confirmation.

### Availability:

#### PHYSICAL CONSTANTS:

Version; mixed product:

Colours/Shade nos:

Finish:

Volume solids, %:

Theoretical spreading rate:

Flash point:

Specific gravity:

Dry to touch:

Fully cured:

V.O.C.:

#### 45751

Grey/12340 - Red/50630

Semi-gloss

79 ± 1

4.0 m<sup>2</sup>/litre - 200 micron

158 sq.ft./US gallon - 8 mils

27°C/81°F

1.6 kg/litre - 13.4 lbs/US gallon

7-8 hours at 20°C/68°F

7 days at 20°C/68°F

260 g/litre - 2.2 lbs/US gallon

#### 45753

Grey/12340 - Red/50630

Semi-gloss

79 ± 1

4.0 m<sup>2</sup>/litre - 200 micron

158 sq.ft./US gallon - 8 mils

27°C/81°F

1.6 kg/litre - 13.4 lbs/US gallon

8-10 hours at 10°C/50°F

14 days at 10°C/50°F

245 g/litre - 2.0 lbs/US gallon

*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:

#### 45751

Base 45755 : Curing agent 97652

3 : 1 by volume

Application method:

Thinner (max.vol.):

Pot life:

Nozzle orifice:

Nozzle pressure:

Cleaning of tools:

Indicated film thickness, dry:

Indicated film thickness, wet:

Recoat interval, min:

Recoat interval, max:

Airless spray

08450 (5%)(See PRECEDING COAT overleaf and separate APPLICATION INSTRUCTIONS)

1 hour (20°C/68°F)

.021"-.023"

250 bar/3600 psi

(Airless spray data are indicative and subject to adjustment)

HEMPEL'S TOOL CLEANER 99610

200 micron/8 mils

250 micron/10 mils

6 hours (20°C/68°F)

See REMARKS overleaf

#### 45753

Base 45755 : Curing agent 98750

3 : 1 by volume

Airless spray

1 hour (20°C/68°F)

.021"-.023"

250 bar/3600 psi

200 micron/8 mils

250 micron/10 mils

12 hours (10°C/50°F)

See REMARKS overleaf

### 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.



**HEMPADUR MULTI-STRENGTH 45751/45753**

SURFACE PREPARATION:

**New steel:**  
**"Heavy duty use":** Abrasive blasting to min. Sa 2½ with a surface profile corresponding to Rugotest No. 3, min. BN10, Keane-Tator Comparator 3.0 G/S, or ISO Comparator Rough Medium (G). Oil and grease must be removed with suitable detergent, salts and other contaminants by (high pressure) fresh water hosing prior to blasting. After blasting, clean the surface carefully from abrasive and dust.  
**Ballast tanks:** For PSPC type approved coating, consult separate APPLICATION INSTRUCTIONS - BALLAST TANKS for HEMPADUR MULTI-STRENGTH 45753.  
**Stainless steel:** (Ballast tanks in chemical carriers) 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.  
**Repair and maintenance:** The actual purpose and conditions may make other types and degrees of surface preparation than the above described relevant. Reference is made to separate application instructions.

APPLICATION CONDITIONS:

Use only where application and curing can proceed at temperatures above -10°C/14°F for HEMPADUR MULTI-STRENGTH 45753 and above 10°C/50°F for HEMPADUR MULTI-STRENGTH 45751. The temperature of the paint itself should be above 15°C/59°F, preferably above 20°C/68°F for HEMPADUR MULTI-STRENGTH 45751, for proper application. Apply only on a dry and clean surface with a temperature above the dew point to avoid condensation. Relative humidity max. 90%. In confined spaces provide adequate ventilation during application and drying.

PRECEDING COAT:

None, but HEMPADUR 15590 can be used as a "blast primer" for HEMPADUR MULTI-STRENGTH 45751. HEMPADUR MULTI-STRENGTH 45753 can be used as a "blast primer" for HEMPADUR MULTI-STRENGTH 45753 when diluted 25-30% with HEMPEL'S THINNER 08450.

SUBSEQUENT COAT:

None, HEMPADUR or HEMPATHANE-paint as per specification, depending on area of use.

REMARKS:

VOC - EU directive 2004/42/EC:

<b>45751</b>				
	As supplied	5 vol. % thinning	Limit phase I, 2007	Limit phase II, 2010
VOC in g/l	260	290	550	500
<b>45753</b>				
	As supplied	5 vol. % thinning	Limit phase I, 2007	Limit phase II, 2010
VOC in g/l	245	275	550	500

VOC:

For VOC of other shades, please refer to Safety Data Sheet.

Colour of curing agent:

The curing agent 98750 has a tendency to become darker at storage. This has no influence on performance, but may influence the shade of the mixed product.

Some **certificates** have been issued under the former quality numbers 45750 or 4575.

HEMPADUR MULTI-STRENGTH 45751 is identical with the former 45750 except that mixing ratio and thixotropy properties have been adjusted to specific demands of application, for instance dual feed two component spray equipment and supply in 1000 litres paint containers.

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 150-250 micron/6-10 mils. It is recommended to use heavy airless spray equipment with a pump transmission rate of 60:1 (approximately), and a theoretical output of min. 12 litres per minute.

Curing agent:

Curing agents 97652 and 98750 are hazy. This is intended and has no negative influence on the performance.



**HEMPADUR MULTI-STRENGTH 45751/45753**

Recoating: Recoating intervals related to later conditions of exposure:  
(200 micron/8 mils dry film thickness of HEMPADUR MULTI-STRENGTH 45751/45753)

	Curing agent 97652						Curing agent 98750					
	Minimum			Maximum			Minimum			Maximum		
Surface temp.	20°C/68°F						10°C/50°F					
Recoated with	Atmospheric			Atmospheric			Atmospheric			Atmospheric		
	Medium	Severe	Immer- sion *	Medium	Severe	Immer- sion *	Medium	Severe	Immer- sion *	Medium	Severe	Immer- sion *
HEMPADUR	4 hours	5 hours	6 hours	None	None	30 days	8 hours	10 hours	12 hours	None	None	60 days
HEMPATHANE Topcoat	4 hours	5 hours	N/R	10 days	3 days	N/R	8 hours	10 hours	N/R	20 days	6 days	N/R

\* and heavy wear - eg bulk cargo holds and fender areas. If such areas are to be topcoated with HEMPATHANE, same max as for atmospheric/severe apply. The long maximum recoating interval for HEMPADUR will be reduced if the coating is more than just scarcely exposed to direct sunshine before recoating. If the interval is exceeded, roughening of surface is necessary to ensure intercoat adhesion.

Thinning: Normally not to be diluted.

Note: **HEMPADUR MULTI-STRENGTH 45751/45753 is for professional use only.**

ISSUED BY: HEMPEL A/S - 4575112340C0007/4575312340C0005

***This Product Data Sheet supersedes those previously issued. For explanations, definitions and scope, see "Explanatory Notes" in the HEMPEL Book.***  
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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 MULTI-STRENGTH 45751/ HEMPADUR MULTI-STRENGTH 45753

Medium to high temperatures: 45751: BASE 45755 with CURING AGENT 97652  
Low to medium temperatures: 45753: BASE 45755 with CURING AGENT 98750

**Scope:** These Application Instructions cover surface preparation, application equipment and application details for HEMPADUR MULTI-STRENGTH 45751/45753.

**Surface preparation:** The specific type and degree of surface preparation depends on type and condition of the actual substrate and on desired performance. The better the surface preparation the better the performance, but it will not always be economic feasible to go for the highest degree within a given type of surface preparation.

**For use as a heavy duty coating:**

Bulk cargo holds, fender areas, hulls of ice-going vessels, ramps, splash zones etc.:

**New steel:**

Abrasive blasting to min. Sa 2½ with a surface profile corresponding to Rugotest No. 3, min. BN10, Keane-Tator Comparator 3.0 G/S, or ISO Comparator Rough Medium (G). Oil and grease must be removed with suitable detergent, salts and other contaminants by (high pressure) fresh water hosing prior to blasting. After blasting, clean the surface carefully from abrasive and dust. HEMPADUR 15590 may be used as a blast primer/hold-coat (min. temperature 10°C/50°F) or alternatively HEMPADUR MULTI-STRENGTH 45751 or HEMPADUR MULTI-STRENGTH 45753 (for temperatures below 10°C/50°F) diluted 15-25% with HEMPEL'S THINNER 08450.

**Old steel:**

For old steel with widespread surface corrosion, often in the state of large areas of fine, dense pit-corrosion - like Grade D, ISO 8501-1:2007 - an overall degree of cleaning corresponding to Sa 2 can be the economical optimum treatment of surfaces exposed to combined mechanical abrasion/impact and atmospheric corrosion in marine environments. May advantageously be combined with a thorough fresh water hosing - or replaced by a water jetting - (degree Wa 2½ according to ISO 8501-4:2006) as long as the formation of flash rust is low, (maximum degree M as per ISO 8501-4:2006).

The fresh water cleaning will assist in removal of salt residues, yet total removal of salts embedded in the pittings will in practise, on large areas, be extremely difficult irrespective of method of cleaning.

In cases where elimination of risk of osmotic blistering is important, for instance frequently/permanently immersed surfaces or fresh water exposure a combined dry abrasive blasting, to remove "black scale" and water jetting (minimum Wa 2½) may be relevant (possible formation of flash rust to be maximum, L).

After water jetting as surface preparation it is recommended to apply a diluted HEMPADUR MULTI-STRENGTH 45751/45753 (15-25% THINNER 08450) as an (extra) first coat. Surfaces to be dry at application.

**Concrete:** The concrete must be of good quality and fully cured, eg 28 days for normal Portland cement, and completely dry with a humidity content in the surface below 4%. The concrete must also be controlled for absence of capillary water action or for subsoil water.

Minimum pull-off value should normally be 20 kilopond/cm<sup>2</sup> measured after surface preparation. Any cracks, crevices and voids must be repaired (see below).

All possible slip agent, oil, grease and other contaminants must be removed by eg abrasive blasting, volatilising by flame cleaning or treatment with suitable detergent. The last mentioned in the following way: Saturation of the surface with fresh water. Washing with suitable detergent followed by fresh water hosing.

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Depending on construction and purpose, abrasive blast, high pressure water jet or treat the concrete with power tools to obtain a rough and firm surface free of scum layer and other contamination and possible old paint/lining. Remove dust and loose material.

If mechanical treatment is impossible, the surface of new concrete may be treated with acid etching. For this purpose an approx. 5% w/w nitric or phosphoric acid solution is recommended.

**Note:** Strong acids, take necessary precautions, make sure that safety regulations are obeyed!

Prior to etching the concrete should be saturated with fresh water to prevent acid corrosion of the reinforcement bars. Leave the acid to act for 3-4 minutes and hose down the surface with fresh water - preferably first a 5% w/w sodium hydroxide solution - and scrub carefully. After that the surface must dry homogeneously and appear as an even, rough surface free of a loose outer layer. The surface must have a pH reaction of between 6.5-8.0. If any of these conditions are not fulfilled, the process must be repeated. The surface must be dried with good ventilation for at least 2 days at 65% relative humidity and 20°C/68°F. The pre-treatment is controlled by scraping with a strong knife. The surface must feel solid and hard, and the knife must only leave a clear scratch mark.

Cracks, voids and crevices must be opened and made good down to firm and hard material. After sealing - as described below - fill these openings with a suitable epoxy mortar.

Seal the surface with HEMPADUR SEALER 05990 in such a way that the surface is just saturated. Surplus must be removed (do also see the Product Data sheet for HEMPADUR SEALER 05990).

### **For use as a ballast tank coating:**

Ballast tanks, steel work:

For optimum performance the following is recommended:

All welding seams must have a surface finish which ensures that the quality of the paint system will be maintained in all respects. Holes in welding seams, undercuts, etc. should be avoided. If found, they may necessitate extra stripe coating or filling (however, the classification societies' recommendations are to be followed).

All sharp edges to be broken or rounded depending on the actual conditions and the design lifetime. Laminations to be removed. However, rolled profiles, etc. from the steel mills normally have acceptably rounded edges.

All loose weld spatters to be removed.

Well adhering, scattered weld spatters are acceptable, but will need additional touch-up. If dense, they must be removed by grinding.

Further reference is made to ISO 8501-3 – minimum recommended preparation grade is P2

Ballast tanks,  
surface preparation:

Before blasting any deposits of grease or oil must be removed from the steel surface with 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.

**Newbuilding/new steelwork:** To obtain full performance of the ballast tank coating, welds, burns, damaged and rusty shopprimer must be abrasive blast cleaned to Sa 2½. Minor areas mechanically cleaned to St 3.

**If welds have previously been coated with a (shop)primer just after welding this (shop)primer must be removed by abrasive blasting (sweeping) in order to obtain optimum performance.**



## HEMPADUR MULTI-STRENGTH 45751/45753

### **Intact shopprimer:**

Zinc salted surfaces, deposits of black iron oxides of plasma cutting and similar foreign matters to be removed by light abrasive sweep blasting. Chalk markings and plate marking of a non-compatible nature to be removed as well.

The shopprimer must have been checked randomly for excessive film thickness and areas detected to have a film thickness above approx 40 micron/1.6 mils (as measured directly on the shopprimed surface with equipment calibrated on smooth steel) are to be sweep blasted in order to remove most of the shopprimer.

Spot-checking for possible salt contamination of the surface to be executed before and after abrasive sweep blasting.

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.

The surface profile to be equivalent to Rugotest No. 3, BN9-BN10 or Keane-Tator Comparator, 3.0 G/S. According to ISO 8503-1 the grade will be MEDIUM (G).

**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 greater and greater overlaps - old layers being roughened corresponding to these overlaps (when sandpapering, use free-cut paper, grain size 80).

Furthermore, these areas may be either masked off with tape - to keep them as narrow as possible - or left with a **thin** zinc epoxy primer coat applied on these areas after secondary surface preparation at blockstage.

Secondary surface preparation of block assembly zones are preferably to be abrasive spot-blasted. However, mechanical cleaning to St 3 may be acceptable if zones are narrow and an extra coat of HEMPADUR MULTI-STRENGTH 45751/45753 diluted approx. 10-15% is applied to these areas as the first coat. 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, ISO Comparator Medium (G), Keane-Tator Comparator 2.0 G/S corresponding to Rz minimum 50 micron). Any salts, grease, oil etc. to be removed before abrasive blasting is commenced.

### **Refurbishment:**

It is recommended to carry out rough abrasive blast cleaning - or water jetting - to facilitate visual inspection and any necessary repair of the existing steel work. In the case of pit-corroded tank bottoms this rough blasting will also provide a better basis for a decision between welding of corroded pits or repair by filling.

Corroded pits deeper than approx. 2 mm, but not repaired by welding, are recommended to be filled with HEMPADUR EPOXY FILLER 35250 after blast priming has been carried out.

At refurbishment, a main concern is the contamination from sea water (water-soluble, corrosive salts). The preventive method will be to include very thorough cleaning with plenty of fresh water, please see below.

**The maximum allowable concentration of chlorides on steel surfaces immediately before application is 7.0 microgrammes/cm<sup>2</sup> as detected by the "Bresle Method".**



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In the case of contamination, cleaning procedures must be repeated and/or improved. Especially pit-corroded steel will need special attention and the only possible way to remove contamination from the pits may often be to carry out very thorough cleaning with fresh water after abrasive blast cleaning. After repeated control and drying, the entire surface will need abrasive blast cleaning to obtain the specified degree of cleaning. Alternatively, the pit-corroded areas are cleaned by water jetting, any surplus of water is mopped up or removed by vacuum cleaning, allow drying.

**Note: Actual type of steel work and surface preparation is dependent on factors such as a shipyard technology, contractual specification, required lifetime, etc. Reference is also made to HEMPEL's Technical Standard for Ballast Tank Coating Work.**

### Application equipment:

HEMPADUR MULTI-STRENGTH 45751/45753, 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	
Regular surfaces:	Ballast tanks	Exterior hull and similar large regular areas
Nozzle size:	.021"-.023"	.023"-.027"
Fan angle:	60-80°	60°-80°
Complicated surfaces:		
Nozzle size:	.019"	
Fan angle:	40°.	

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

**Note:** Increasing spray 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.

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 overthinning. Airless spray data are indicative and subject to adjustment.

### Application:

**Film-build/continuity:** It is especially important that a continuous, pinhole-free paint film is 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 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.

Sagging/"pools" of paint in corners are to be remedied to avoid later cracking and as a general rule highest acceptable dry film thickness will be 3 times the specified film thickness or 1000 micron.

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.



## HEMPADUR MULTI-STRENGTH 45751/45753

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

When measured under standard conditions the pot life is 2 hours at 15°C/59°F and 1 hour 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 packings. If it is necessary to mix smaller portions, this must be done properly by either weighing base and curing agent. The weight ratio for HEMPADUR MULTI-STRENGTH 45751/45753 is 135 parts by weight of base and 25 parts by weight of curing agent or by volume: 3.0 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):

Temperature of mixed paint	15°C/59°F <sup>1)</sup>	20°C/68°F	25°C/77°F	30°C/86°F <sup>2)</sup>
Pot life	2 hours	1 hour	½ hour	(1/4 hour)

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

### Induction time:

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

**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.

### Physical data versus temperature:

(HEMPADUR MULTI-STRENGTH 45751 in a dry film thickness of 200 micron/8 mils):

Surface temperature	10°C/50°F	20°C/68°F	30°C/86°F
Drying time	20 hours	8 hours	4 hours
Curing time*	18 days	7 days	3½ days
Initial curing*	13 days	5 days	2½ days

(HEMPADUR MULTI-STRENGTH 45753 in a dry film thickness of 200 micron/8 mils):

Surface temperature	-10°C/14°F	0°C/32°F	10°C/50°F
Drying time	45 hours	23 hours	10 hours
Curing time*	63 days	32 days	14 days
Initial curing*	45 days	23 days	10 days

\* Filling of ballast tanks/exposure to water: ask for special instructions.

### Ventilation:

Correct film formation depends on adequate ventilation during drying.

The total volume of solvent vapour released until the coating is completely dry is 66 litres for one litre of undiluted HEMPADUR MULTI-STRENGTH 45751/45753.

The lower explosive limit, LEL, is 1.0%.

To reach a common safety requirement of 10% LEL, the theoretical ventilation requirement is 66m<sup>3</sup> per litre paint.





## HEMPADUR MULTI-STRENGTH 45751/45753

### 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 - 4575112340C0007/4575312340C0005

***This Product Data Sheet supersedes those previously issued.***

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

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# Application Instructions

## BALLAST TANKS

For product description refer to product data sheet

### HEMPADUR MULTI-STRENGTH 45753

45753: BASE 45755 with CURING AGENT 98750

#### Scope:

These Application Instructions cover surface preparation, application equipment and application details for HEMPADUR MULTI-STRENGTH 45753 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.

Surfaces with zinc salts, deposits of black iron oxides from plasma cutting, markings and similar foreign matters shall be cleaned by light abrasive sweep blasting.



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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/m<sup>2</sup> sodium chloride equivalents when measured according to 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 MULTI-STRENGTH 45753.

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 MULTI-STRENGTH 45753, 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		
Regular surfaces:		Complicated surfaces	
Nozzle size:	.021"-.023"	Nozzle size:	.019"
Fan angle:	60-80°	Fan angle:	60°



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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. 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 <sup>1)</sup>	20°C/68°F	25°C/77°F	30°C/86°F <sup>2)</sup>
Pot life	2 hours	1 hour	½ hour	(1/4 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 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 MULTI-STRENGTH 45753 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
Drying time	32 hours	16 hours	7 hours	3½ hours
Walk-on time	54 hours	27 hours	12 hours	6 hours
Curing time	63 days	32 days	14 days	7 days
Initial curing*	45 days	23 days	10 days	5 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)  
(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
Recoating time**	41 hours	21 hours	9 hours	5 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.



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- 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 m<sup>2</sup>/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 - 4575312340C0005

***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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