

Low to medium temperature 45703: BASE 45705 with CURING AGENT 98750

For product description refer to product data sheet 45703

Scope: These Application Instructions cover surface preparation, application equipment and application details for HEMPADUR MULTI-STRENGTH 45703.

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) alternatively HEMPADUR MULTI-STRENGTH 45703 (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 45703 (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/cm² 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.

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

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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).

Ballast tanks, steel work:

For use as a ballast tank coating:

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.

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).

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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 45703 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/cm² as detected by the "Bresle Method".

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 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 45703, 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: | 0,021"-0,023" | 0,023"-0,027" |
| Fan angle: | 60°-80° | 60°-80° |
| Complicated surfaces (and touch up): | | |
| Nozzle size: | 0,019" | |
| Fan angle: | 40° | |

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

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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 600 micron per coat. 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.

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

When measured under standard conditions the pot life is 2 hours at 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 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 45703 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 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 ¹⁾ | 20°C/68°F | 25°C/77°F | 30°C/86°F ²⁾ |
| 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 45703 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.

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- 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 45703.
- The lower explosive limit, LEL, is 1.0%.
- To reach a common safety requirement of 10% LEL, the theoretical ventilation requirement is 66m³ per litre paint.
- 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 - 45703

These Application Instructions supersede those previously issued.

For explanations, definitions and scope see "Explanatory Notes" available on www.hempel.com. 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. The Products are supplied and all technical assistance is given subject to Hempel's general conditions of sales, delivery and service, unless otherwise expressly agreed in writing. The Manufacturer and Seller disclaim, and Buyer and/or User waive all claims involving, any liability, including but not limited to negligence, except as expressed in said general conditions for all results, injury or direct or consequential losses or damages arising from the use of the Products as recommended above, on the overleaf or otherwise. Product data are subject to change without notice and become void five years from the date of issue.