Application Instructions
IMO Resolutions MSC.215 (82) & MSC.288(87)
HEMPADUR QUATTRO 17634

17634: BASE 17636 with CURING AGENT 97334

For product description refer to product data sheet 17634

Scope:

These Application Instructions cover surface preparation, application equipment and application details for HEMPADUR 17634 when applied in ballast tanks and cargo oil tanks according to the requirements in IMO Resolutions MSC.215(82) and MSC.288(87), respectively. Applications Instructions are also applicable for vessels not covered by PSPC.

Steel work (PSPC):

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

The steel surface shall be thoroughly prepared so that the coating achieves an even distribution at the specified nominal dry film thickness of 320 micron and has an adequate adhesion. The final steel condition including welds and edges shall conform to preparation grade P2, ISO 8501-3: “Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness”.

Abrasive blasting/ abrasive sweep blasting:

The coating system shall only be applied to steel primed with a pre-qualified, inhibitor-free zinc silicate shopprimer. Steel shopprimed with a non-pre-qualified shopprimer must be abrasive blast cleaned to Sa 2 removing at least 70% of intact shopprimer. 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 and 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.

When holding primer used, additional instructions on surface preparation shall be considered. Prior to application of the holding primer the surface must be completely free of dust, contamination and any foreign matters.

The holding primer must be applied homogeneously and as close to the specification as possible. Care must be taken to cover edges, openings, rear side of stiffeners, etc. Thus on these areas a stripe coat will need to be applied.

The surface must be completely clean and free of any contaminants before overcoating in order to ensure proper inter-coat adhesion, and the coating must show no sign of degradation. Overcoating of the holding primer shall be in accordance with the overcoating intervals stated in the Product Data Sheet and Application Instructions of the holding primer.

Exposure of the holding primer to sun light should be avoided. Degradation from such exposure or caused by other sources must be removed by mechanical cleaning methods like water jetting, abrading or preferably sweep abrasive blasting.

Mechanical and corrosion damages must be cleaned by abrasive blasting to Sa 2½, minor areas may be mechanically cleaned to St 3, according to ISO 8501:1-2007.

Prior to the application of the first full coat of HEMPADUR QUATTRO 17634, the entire surface must be cleaned by appropriate means (which could include suitable detergent followed by high pressure fresh water cleaning depending on type and extent of contamination).

If the maximum recoating interval as stated above is exceeded, roughening of the entire surface is required to ensure satisfactory inter-coat adhesion.

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.

Welds coated with a temporary shopprimer after welding must be cleaned by dry abrasive blasting to a cleanliness degree of Sa2½ according to ISO 8501-1.

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.

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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, BN9-10 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 classes "3", "4" or "5" according to ISO 8502-3:1992. 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 feathered and consecutive layers of paint coatings given larger and larger overlaps. Roughening must be carried out when the maximum overcoating interval is exceeded (when sand papering, use free-cut paper, grain size 80).

Furthermore, these areas may also be 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 17634.

Secondary surface preparation of block assembly zones is preferably abrasive spot-blasting to Sa 2½, when practicable, or mechanical cleaning to minimum 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: (E.g. Ballast tanks of chemical carriers) To be abrasive blast cleaned to a uniform, sharp, dense, profile (equivalent to surface roughness comparator Rugotest No. 3, BN9-10 or ISO Comparator Medium (G), corresponding to Rz minimum 60 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. Paint application to take place as soon as possible after surface preparation of stainless steel is finalised.

Application equipment: HEMPADUR 17634, 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:	0,021"-0,025"
Fan angle:	60°-80°

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 maximum 85% and the steel temperature shall be 3°C/5°F above the dew point.

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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 brush or roller. 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 for spraying is 3 hours at 15°C/59°F and 2 hours at 20°C/68°F. However, for a 20-litre/5-US gallon 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 part 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-litre can):

Temperature of mixed paint	15°C/59°F1)	20°C/68°F	25°C/77°F	30°C/86°F2)
Pot life (spray application)	3 hours	2 hours	1½ hours	1 hour

1) Temperatures below 15°C/59°F should preferably be avoided.
2) Temperatures above 30°C/86°F should preferably be avoided.

Induction time:

At steel temperatures below 5°C/41°F, the mixed paint may advantageously be pre-reacted for 10-20 minutes before spray application (longer pre-reaction times at lower steel temperatures). Remix the paint again before application.

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 approximately 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 shall be 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	Remarks
Minimum DFT per coat	90/3.5	Value for undiluted paint at approximately 20°C/68°F. Lower DFT may be achieved by thinning.

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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. No more than 5% of the area must be above 1,300 micron/52 mils. 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 17634 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	35 hours	14 hours	7 hours	4 hours	3 hours
Walk-on time	42 hours	21 hours	9 hours	4½ hours	3½ 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.

Overcoating:

Overcoating intervals (provided proper ventilation)
HEMPADUR 17634 in a dry film thickness of 160 micron/6.4:

Minimum overcoating interval

Steel temperature	-10°C/14°F	0°C/32°F	10°C/50°F	20°C/68°F	30°C/86°F	40°C/104°F
Overcoating time*	49 hours	25 hours	11 hours	5 hours	4 hours	3 hours

Maximum overcoating interval

Steel temperature	-10°C/14°F	0°C/32°F	10°C/50°F	20°C/68°F	30°C/86°F	40°C/104°F
Overcoating time**	90 days	90 days	60 days	30 days	22½ days	15 days

* Stripe coat can be applied when it is possible to walk on the surface without damage to the coating.
** Depending on actual local conditions, extended maximum overcoating intervals may apply. Please contact HEMPEL for further advice.

Long overcoating intervals

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

A completely clean surface is mandatory to ensure intercoat adhesion, especially in the case of long overcoating intervals. Any dirt, oil and grease have to be removed with e.g. 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.

Repair process:

During construction
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.

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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:
Ballast tanks: Contiguous areas over 25 m²/270 sq.ft. or over 2% of the total area of the ballast tank are to be repaired basically according to the original specification. Sa 2½ shall be applied.

Cargo oil tanks, inner bottom: Contiguous areas over 25 m²/270 sq.ft. or over 2% of the total area of the cargo oil tank are to be repaired basically according to the original specification. Sa 2½ shall be applied.

Cargo oil tanks, underdeck: Contiguous areas over 25 m²/270 sq.ft. or over 3% of the total area of the cargo oil tank are to be repaired basically according to the original specification. Sa 2½ shall be applied.

In all cases, damage due to over-blasting must be avoided.

During service
Maintenance and repair during service is subject to the actual condition of the area under consideration. Reference is made to IMO Guidelines for maintenance and repair of protective coatings, MSC.1/Circ.1330 for ballast tanks and MSC.1/Circ.1399 for cargo oil tanks.

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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