Tankguard Special Ultra

Product description

This is a two component polyamine cured novolac epoxy coating. Specially designed tank coating with excellent chemical resistance and a turn-around time of 5 days after carriage of methanol. Developed as a 3-coat system for optimum chemical resistance in atmospheric and immersed environments. Suitable for properly prepared carbon steel, galvanised steel and stainless steel substrates. It can be applied down to +5 °C surface temperature.

Scope

The Application Guide offers product details and recommended practices for the use of the product.

The data and information provided are not definite requirements. They are guidelines to assist with efficient and safe use, and optimum service of the product. Adherence to the guidelines does not relieve the applicator of responsibility for ensuring that the work meets specification requirements.
Jotuns liability is in accordance with general product liability rules.

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A successful tankcoating job is dependent on the quality of planning and performance of the following activities and are covered in this document:
- Staging
- Lighting
- Steel preparation
- Surface preparation
- Coating application
- Health and safety control

Projects specified to the requirements in Performance Standard for Protective Coatings (PSPC)

For application and repair / maintenance requirements according to IMO MSC.215 (82) for dedicated Sea Water Ballast Tanks (WBT), and/or to IMO MSC.288 (87) for Cargo Oil Tanks of Crude Oil Tankers (COT) reference is made to the PSPC Appendix in this document.

Referred standards

Reference is generally made to ISO Standards. When using standards from other regions it is recommended to reference only one corresponding standard for the substrate being treated.

Surface preparation

The required quality of surface preparation can vary depending on the area of use, expected durability and if applicable, project specification.

When preparing new surfaces, maintaining already coated surfaces or aged coatings it is necessary to remove all contamination that can interfere with coating adhesion, and prepare a sound substrate for the subsequent product.

Inspect the surface for hydrocarbon and other contamination and if present, remove with an alkaline detergent. Agitate the surface to activate the cleaner and before it dries, wash the treated area using fresh water.
Paint solvents (thinners) shall not be used for general degreasing or preparation of the surface for painting due to the risk of spreading dissolved hydrocarbon contamination. Paint thinners can be used to treat small localized

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areas of contamination such as marks from marker pens. Use clean, white cotton cloths that are turned and replaced often. Do not bundle used solvent saturated cloths. Place used cloths into water.
When the surface is an existing coating, verify with technical data sheet and application guide of the involved products, both over coatability and the given maximum over coating interval.

Process sequence

Surface preparation and coating should normally be commenced only after all welding, degreasing, removal of sharp edges, weld spatter and treatment of welds is complete. It is important that all hot work is completed before coating commences.

Soluble salts removal

Soluble salts have a negative impact on the coating systems performance, especially when immersed. Jotun's general recommendations for maximum soluble salts (sampled and measured as per ISO 8502-6 and -9) content on a surface are:

Chemical tanks: 50 mg/m²
Crude oil tanks (PSPC): 50 mg/m²

Carbon steel

Initial rust grade

The steel shall preferably be Rust Grade A or B (ISO 8501-1). The use of C grade steel requires more thorough surface preparation and possibly more paint to achieve the specified DFT. The chloride contamination risk with Rust Grade C steel is significantly higher, so if this steel is used the frequency of inspection and testing for surface salt content should be increased and emphasized.

Metal finishing

All welds, sharp edges and corners shall be prepared to conform to ISO 8501-3 Table 1, minimum grade P3. Defective welds shall be replaced and treated to an acceptable finish before painting. All edges shall have a rounded radius of minimum 2 mm. One may use a mechanical grinder fitted with a suitable abrasive disc. All sharp irregularities, burrs, slivers, slag and spatter on welds, whether apparent before or after blast cleaning, shall be removed before coating application.
Welding smoke is water soluble and it is most efficiently removed by water cleaning. Before blasting it is necessary to carry out high pressure fresh water washing if the salt level is high, in order to avoid high salt level after blasting. All debris should be removed and the tank allowed to dry.

Pitting repair

Pittings in steel can be difficult to cover fully with most coatings. In some areas it is practically feasible to use filler to fill pittings. This should then be done either after the initial surface preparation or after application of first coat.
For tank coating and lining used for chemical exposure the recommendation is to fill pitts through welding, since using fillers may negatively affect the coating systems' chemical resistance and flexibility.

Abrasive blast cleaning

Application of protective coating shall commence before degradation of the surface standard occurs.

Cleanliness

After pre-treatment is complete, the surface shall be dry abrasive blast cleaned to Sa 2½ (ISO 8501-1) using abrasive media suitable to achieve a sharp and angular surface profile.

Surface profile

Recommended surface profile 50-100 µm, grade Medium to Coarse G (ISO 8503-2). Measure the achieved profile with surface replication tape (Testex) to ISO 8503-5 or by a surface roughness stylus instrument (ISO 8503-4).

Abrasive media quality

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The mineral abrasive may be of any material that meets the specified requirements. It shall be composed of clean, sound, hard particles free from foreign substances such as dirt, oil, grease, toxic substances, paint, organic matter and water soluble salts. (According to ISO 11125 and ISO 11126).
The moisture content for material delivered shall not exceed 0.5% (by weight) and the conductivity when tested according to ISO 11127-7 shall not exceed 250 µS/cm.

Compressed air quality

The supply of clean air to blasting pots must be secured to avoid contamination of abrasive and thereby of blast cleaned surfaces. Compressors must be fitted with sufficient traps for oil and water. It is also recommended to fit two water separators at the blasting machine to ensure a supply of moisture-free air to the abrasive chamber.

Dust contamination

On completion of abrasive blasting, the prepared surface shall be vacuum cleaned to remove residues of corrosion products and abrasive media, and inspected for particulate contamination.
Maximum dust quantity rating 1 (ISO 8502-3). Dust size no greater than class 2. Continue cleaning until testing shows the required result.

Hand and Power Tool Cleaning

Power tool cleaning

Minor damage of the coating may be prepared to St 3 (ISO 8501-1). Suitable method is disc grinding with rough discs only. Ensure the surface is free from mill scale, residual corrosion, failed coating and is suitable for painting. The surface should appear rough and mat.
Overlapping zones to intact coating shall have all leading edges feathered back by sanding methods to remove all sharp leading edges and establish a smooth transition from the exposed substrate to the surrounding coating. Consecutive layers of coating shall be feathered to expose each layer and new coating shall always overlap to an abraded existing layer. Abrade intact coatings around the damaged areas for a minimum 100 mm to ensure a mat, rough surface profile, suitable for over coating.

Stainless steel

Tank interior details of stainless steel may be coated with this product provided it is treated to the same standard as the tank surface. However, it is not necessary to treat and paint stainless steel material. In general only a minor overlap of 5 cm is recommended on items such as handrails, ladders, support and similar.

Abrasive blast cleaning

The surface to be coated shall be dry abrasive blast cleaned as required for the specified surface profile using non-metallic abrasive media which is suitable to achieve a sharp and angular surface profile. As a guide, a surface profile corresponding to 25-55 µm, grade Fine G; Ry5 (ISO 8503-2) should be achieved.

Examples of recommended abrasives are:
- Ferrite free almandite garnet grade 30/60 and 80 grade (US Mesh size)
- Aluminium oxide grade G24

Passivation of material:
Passivation of stainless steel should preferably be done before installation in the tank. If done in the tank, care should be taken on protection of coated surface and the coating system during passivation.

Chlorinated or chlorine containing solvents or detergents must not be used on stainless steel.

Coated surfaces

Shop primers

Shop primers are accepted as temporary protection of steel plates and profiles. However the shopprimer should be completely removed through blast cleaning to minimum Sa 2½ (ISO 8501-1) using abrasive media suitable to achieve a sharp and angular surface profile 50-100 µm, grade Medium to Course G; Ry5 (ISO 8503- 2).

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Application

Environmental conditions

Normally dehumidifier should be used during blasting, cleaning and painting. In addition, if low temperatures and heating is required, the steel temperature should achieve a stable temperature throughout blasting, cleaning and painting till curing is complete. It is wise to ensure that adjacent spaces are kept heated as well. This to reduce any risk of "Cold Wall" effect or "Skin Dry" effect upon the coating.

Acceptable environmental conditions - before and during application

Before application, test the atmospheric conditions in the vicinity of the substrate for the dew formation according to ISO 8502-4.

Air temperature	5 - 50	°C
Substrate temperature	5 - 50	°C
Relative Humidity (RH)	10 - 85	%

The following restrictions must be observed:

- Only apply the coating when the substrate temperature is at least 3 °C (5 °F) above the dew point
- Do not apply the coating if the substrate is wet or likely to become wet

For optimum performance it is recommended to keep substrate temperature above 10°C.

Material storage conditions

In hot climates the paint should be kept in a shaded and ventilated area, not in direct sunlight. The maximum temperature of the paint during storage is 40 °C, but preferably not above 30 °C. The temperature of the paint during storage must be above 0 °C and minimum 5 °C during application.

Product mixing

Product mixing ratio (by volume)

Tankguard Special Ultra Comp A	4 part(s)
Tankguard Special Ultra Comp B	1 part(s)

Product mixing

The temperature of the wet coating will affect its viscosity. Low temperature will increase viscosity, high temperatures will reduce it.

Mechanically stir component A. Add component B slowly to component A, while continuously stirring. Make sure that all of component B is added into component A. Continue stirring until the mixture is homogenous. Do not combine the components until you are ready to start application, and take note of the recommended induction time for the product, especially in colder weather.

The temperature of base and curing agent should preferably be 15°C or higher when the paint is applied. As with lower temperatures, there is an increased risk of amine sweating after application. The viscosity will increase at lower temperatures and longer induction time is needed. Induction time is the time where the mixed product is left in the can in order to get curing of the product initiated.
The induction time is important to make the curing process start. In hot weather only one set of pre-mixed components should be combined in order to avoid inconvenient pot life expiry.
Monitor the volume of mixed product. When the previous set is low in volume, mix the next set and add it to the paint container.

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Induction time and Pot life

Paint temperature	5 °C	10 °C	15 °C	23 °C	30 °C	40 °C
Induction time	30 min	25 min	20 min	15 min	10 min	5 min
Pot life	4 h	3 h	3 h	2 h	1.5 h	1 h

Induction time 30 min is compulsory for paint used for touch-up with brush and roller.

The temperature of base and curing agent is recommended to be 18 °C or higher when the product is mixed.

Thinner/Cleaning solvent

Thinner: Jotun Thinner No. 17 / Jotun Thinner No. 23

Thinning may be required to adjust the spray pattern and for rolling and brushing. Thinning will lower the viscosity, which can reduce sag resistance. Thinning must be done with care as this will result in a lower maximum thickness. Excessive thinning can also lead to solvent entrapment, particularly in hot weather. Thinning should be kept at a minimum.
Measure the thinner volume accurately with a measuring container. Do not add thinner by eye measurement.
Always have sufficient tools available in order to be able to dismantle and clean out the application equipment should blockages or an unscheduled stop to the work occur.
When using single feed airless spray and conventional air spray equipment ensure the pump, pressure pot, lines and gun are fully flushed with thinner after spraying stops for a prolonged period.
When using two component airless spray ensure that the mixing chamber, material hose and gun are flushed with thinner when spraying stops for a prolonged period.
For the main coat, maximum 5% thinning. For touch-up / stripe coat, up to 15% thinning is acceptable. Jotun Thinner No. 17 / Jotun Thinner No. 23 is recommended.

It is of vital importance that the nozzle and other parts of the spray equipment are cleaned properly directly after spraying, in order to prevent cured paint inside the equipment.

Hoses should be of good quality and not longer than necessary. If longer hoses are used it may be necessary to increase the pump capacity/pressure. Lower temperature paint will also have an impact on the pressure due to the increase of viscosity.

Ideally the pump stations should be situated close to the tank and sheltered. In cold climate condition this should be a heated area.
Increasing hose diameter may ease paint flow thereby improving the spray fan with good atomization.

Application data

Spray application

Airless Spray Equipment

Pump ratio (minimum) :	42:1
Pressure at nozzle (minimum) :	150 bar/2100 psi
Nozzle tip (inch/1000) :	17-23
Nozzle output (litres/minute) :	1.3- 2.2
Spray angle :	30 - 60
Filters (mesh) :	70

Note*
Several factors influence and need to be observed to maintain the recommended fluid flow/product atomization pattern. Among factors causing pressure drop are:
- Pump size
- Extended hoses or hose bundles
- Extended hose whip-end line
- Small internal diameter hoses
- Narrow tip angle
- High paint viscosity

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- Large spray nozzle size
- Inadequate air capacity from compressor
- Incorrect or clogged filters
- Product temperatures

It is of vital importance that the nozzle and other parts of the spray equipment are cleaned properly directly after the work is done due to the on-going curing process. If a pail is used under the spray pump and new paint poured into it, this pail must be changed regularly so that paint material with expired pot life is not sucked into the spray gun. The hoses should be of good quality, clean and as short as possible. 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 capacity. The hose length and diameter selection is also temperature dependent. Hose selection is also influenced by the elevation of the spray gun above the pump.

Plural component (Twin Pump) airless spray equipment

When using plural spray equipment, Jotun recommends the use of either a pump with computerised pump ratio settings or fixed ratio settings in combination with a flow meter for each pump to monitor the proper delivery ratio of the coating components is maintained during use.

Recommended data for pump output, pressure at nozzle, nozzle tip and filters are the same as for airless spray equipment.

Spray application technique

Pay close attention to both spraying technique and the correct setting of equipment during application in order to achieve an even, pinhole free film. A combination of the correct inbound air / outbound material pressure, correct airless tip or spray set up and a 30-50 cm gun to substrate distance is recommended. Apply the coating in even and uniform parallel passes and overlap each pass 50% to achieve an even film. Use a painter's wet film comb during application to control the wet to dry film thickness of the coating.

Other application tools

Brush application

Suitable for application by brush. Recommended for first coat or stripe coating application in corners, on edges and other areas difficult to reach. A stiff brush is recommended. It will be necessary to apply additional coats to achieve a similar dry film thickness as when the coating is applied by airless spray.

Roller application

Suitable for application by roller. The addition of a small volume of thinner is recommended to achieve improved flow. In tanks roller is recommended for scallops and rat holes only.

Film thickness per coat

Typical recommended specification range

Dry film thickness	80	-	150	µm
Wet film thickness	115	-	215	µm
Theoretical spreading rate	8.8	-	4.7	m²/l

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Maximum recommended film thickness is often exceeded in overlap zones and in difficult-to-spray areas. This product can be applied up to 50% higher than film thickness stated in the official specification provided by Jotun for respective project without loss of technical properties.

Film thickness measurement

DFT control must be done using approved markers, which have been tested and approved for use in tank coating with this product.

Wet film thickness (WFT) measurement and calculation

To ensure correct film thickness, it is recommended to measure the wet film thickness continuously during application using a painter's wet film comb (ISO 2808 Method 1A). The measurements should be done as soon as possible after application.
Fast drying paints may give incorrect (too low) readings resulting in excessive dry film thickness. For multi layer physically drying (resoluble) coating systems the wet film thickness comb may give too high readings resulting in too low dry film thickness of the intermediate and top coats.
Use a wet-to-dry film calculation table (available on the Jotun Web site) to calculate the required wet film thickness per coat.

Dry film thickness (DFT) measurement

When the coating has cured to hard dry state the dry film thickness can be checked to SSPC PA 2 or equivalent standard using statistical sampling to verify the actual dry film thickness. Measurement and control of the WFT and DFT on welds is done by measuring adjacent to and no further than 15 mm from the weld.

Application / Drying / Curing considerations

Pay close attention to both spraying technique and the correct setting of equipment during application in order to achieve an even, pinhole free film. A combination of the correct inbound air / outbound material pressure, correct airless tip or spray set up and a 30-50 cm gun to substrate distance is recommended. Apply the coating in even and uniform parallel passes and overlap each pass 50% to achieve an even film. Use a painter’s wet film comb during application to control the wet to dry film thickness of the coating.

Ventilation

When a tank coating is applied the solvent will evaporate and produce an explosive atmosphere unless the solvent concentration is kept at a non-explosive level. Forced artificial ventilation will be required. During application it is recommended to provide enough ventilation to have a safe work environment and to ensure that solvent concentration in the tank at no time exceeds the maximum permitted according to local health and safety regulations. This is usually 10% of the product’s Lower Explosive Limit.
As a guideline for good ventilation, after application of each coat the confined space should be ventilated with 3-5 cycles per hour. After final coat maintain 3-5 cycles per hour for minimum 48 hours. Thereafter the number of cycles can be reduced to 1-2 cycles per hour until coating is fully cured.

Stripe coating

The stripe coat sequence can be either of the following:

1. Surface preparation, full coat, stripe coat. This sequence can be used when a large substrate area has been prepared and leaving the substrate exposed for a long time while doing stripe coating could lead to surface deterioration.
2. Surface preparation, stripe coat, full coat.

In general Jotun recommends alternative 1 because it reduces the risk that “new” contamination will be introduced to the uncoated substrate.
Walking on the blast cleaned substrate in order to do the stripe coating presents a risk for such contamination.
It is important to pay special attention to edges, openings, rear sides of stiffeners, scallops etc. and to apply a stripe coat to these areas where the spray fan may not reach or deposit an even film.
When applying a stripe coat to bare metal use only a stiff, round stripe coating brush to ensure surface wetting and filling of pits in the surface. Stripe coating shall be of a different colour to the main primer coat and the topcoat colour and should be applied in an even film thickness, avoiding excessive brush marks in order to avoid entrapped air. Care should be taken to avoid excessive film thickness. Pay additional attention to pot life during application of stripe coats. Jotun recommends a minimum of one stripe coat. A second stripe coat will be beneficial in order to ensure that sufficient paint material is applied to the critical parts of the object.
Jotun recommends two stripe coats. A second stripe coat, with the same colour as the first full coat, will be

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beneficial in order to ensure that sufficient paint material is applied to the critical parts of the object.

After each full coat and before stripe coat and dry spray, runs or excessive thickness to be removed by glass, fibrepad, scouring pad, fine sandpaper and subsequently vacuum cleaned prior to stripe coating.

Each coat of the system must be a closed film and free from over spray, curtaining, sags, holidays, grit and dirt inclusion. Any such defects are to be repaired prior to the application of the next coat of the system, and within the overcoating limits of the paints. Any dust caused by the repair of defects is to be removed from the tank by vacuum cleaning.

Coating loss

The consumption of paint should be controlled carefully, with thorough planning and a practical approach to reducing loss. Application of liquid coatings will result in some material loss. Understanding the ways that coating can be lost during the application process, and making appropriate changes, can help reducing material loss.
Some of the factors that can influence the loss of coating material are:
- type of spray gun/unit used
- air pressure used for airless pump or for atomization
- orifice size of the spray tip or nozzle
- fan width of the spray tip or nozzle
- the amount of thinner added
- the distance between spray gun and substrate
- the profile or surface roughness of the substrate. Higher profiles will lead to a higher "dead volume"
- the shape of the substrate target
- environmental conditions such as wind and air temperature

Drying and Curing time

Substrate temperature	5 °C	10 °C	15 °C	23 °C	30 °C	40 °C
Surface (touch) dry	24 h	16 h	6 h	4 h	3 h	2 h
Surface (touch) dry	36 h	24 h	10 h	7 h	4 h	3 h
Dry to over coat, minimum	36 h	24 h	20 h	16 h	14 h	10 h
Dried/cured for immersion	15 d	7 d	5 d	4 d	3 d	2 d
Dried/cured for service	30 d	14 d	10 d	7 d	4 d	3 d

Drying and curing times are determined under controlled temperatures and relative humidity below 85 %, and at average of the DFT range for the product.

Preconditioning (minimum three-month period after the carriage of first cargo) or hot cure is required to carry certain aggressive cargoes. For further information, please see Jotun Marine Tank Coating Notes (General Note III) and Specific Notes for cargoes on www.jotunprl.com

Surface (touch) dry: The state of drying when slight pressure with a finger does not leave an imprint or reveal tackiness.

Walk-on-dry: Minimum time before the coating can tolerate normal foot traffic without permanent marks, imprints or other physical damage.

Dry to over coat, minimum: The recommended shortest time before the next coat can be applied.

Dried/cured for immersion: Minimum time before the coating can be permanently immersed in sea water.

Dried/cured for service: Minimum time before the coating can be permanently exposed to the intended environment/medium.

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Maximum over coating intervals

Maximum time before thorough surface preparation is required. The surface must be clean and dry and suitable for over coating. Inspect the surface for chalking and other contamination and if present, remove with an alkaline detergent. Agitate the surface to activate the cleaner and before it dries, wash the treated area by low-pressure water cleaning using fresh water.

Where an extended overcoating time is stated, the product can be overcoated after an extended time period, however the anticipated level of inter-coat adhesion can only be achieved through good painting practices.

The max overcoating time the product is able to achieve without any surface perpetration depends on environmental exposure conditions (such as UV, temperature, humidity etc.), system composition and other factors.

If the surface has signs of chalking or any contamination, surface treatment, such as methodical abrading followed by freshwater washing should be employed. Alkaline detergent should be used to remove heavy contamination. If you are unsure a test patch should be used to consider sufficient cohesion.

If maximum over coating interval is exceeded the surface should in addition be carefully roughened to ensure good inter coat adhesion.

Areas for atmospheric exposure

Average temperature during drying/curing	5 °C	10 °C	15 °C	23 °C	30 °C	40 °C
Itself	30 d	30 d	25 d	21 d	14 d	7 d

Areas for immersed exposure

Average temperature during drying/curing	5 °C	10 °C	15 °C	23 °C	30 °C	40 °C
Itself	30 d	30 d	25 d	21 d	14 d	7 d

Other conditions that can affect drying / curing / over coating

Repair of coating system

Superficial damages not exposing bare substrate:
Prepare the area through sandpapering or grinding, followed by thorough cleaning/vacuuming. When the surface is dry and clean the coating may be over coated by itself or by another product, ref. original specification. Always observe the minimum and maximum over coating intervals. If the maximum over coating interval is exceeded the surface should be carefully roughened in order to ensure good intercoat adhesion.

Damages exposing bare substrate:
Remove all rust, loose paint, grease or other contaminants by spot blasting, mechanical grinding, water- and/or solvent washing.

Damage to the coating that exposes bare steel are recommended to be dry abrasive blast cleaned to Sa 2½ (ISO 8501-1) assuming it is practically viable, preferably by the use of vacuum blasting equipment. Minor coating damages in which the individual size is less than 20 cm X 20 cm, and the accumulated area is less than 1 m² or 0.1% of the total coated surfaces, whichever is the smaller extent may be prepared to St 3 (ISO 8501-1). Care must be taken to avoid polishing of the bare steel surface. Feather edges and roughen the overlap zone of surrounding intact coating.

In cases where there are minor mechanical or stress related damages in a tank after sea-trial or water immersion testing, one has to consider the amount of damages compared to how many potential new damages will be made when re-installing scaffolding. For minor areas mechanical grinding and touch up is considered common practice. Hard to reach spots shall be repaired using best practical means and methods.

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Overlapping zones to intact coating shall be masked off with a minimum 200 mm distance to the damage and should cover the surrounding area so that overspray to sound coating does not occur during repair application. Edges of intact coating around damage shall be feathered to ensure a smooth transition from the coating to the prepared steel. Consecutive layers of coating shall be feathered to expose each layer and new coating shall always overlap to an abraded existing layer.

Apply the coating system specified for repair.

Repair of damaged areas

Areas with too low DFT:
Roughen the surface, vacuum and apply new coating according to specification.

Areas with too high DFT:
Areas with DFT above maximum specified for isolated areas shall be ground down to acceptable thickness, or down to bare steel and recoated.

Coating film continuity

Jotun recommends that all coating systems for immersion shall be inspected for film continuity/defects by visual observation of pin hole rusting through the coating after tank hydro-testing or sea water immersion during sea trials. Alternatively, full immersion of tanks in combination with tanks fully saturated by tank cleaning machine (s), soaking all surfaces with sea water and creating a high condensation environment during sea trials.

All noted defects shall be repaired or reported as outstanding issues.

For onshore storage tanks or for tanks where sea water immersion may not be permitted or practical, coating shall be tested for film continuity/defects as described in ASTM D 5162, method A or B as appropriate for the coating thickness.

The recommended voltage is 500 volts per 100 µm DFT. The acceptance criterion is no defects. Defects found shall be repaired as per coating specification.

Performance Standard for Protective Coatings (PSPC)

PSPC Appendix (COT)
Application requirements particular for coating according to Performance Standard for Protective Coatings (PSPC) of cargo oil tanks of crude oil tankers to IMO Resolution MSC.288(87)

Job specification
There shall be a minimum of two stripe coats and two spray coats, except that the second stripe coat, by way of welded seams only, may be reduced in scope where it is proven that the NDFT (nominal total dry film thickness) can be met by the coats applied in order to avoid unnecessary over thickness. Any reduction in scope of the second stripe coat shall be fully detailed in the CTF.

NDFT (nominal total dry film thickness)
NDFT 320 µm with 90/10 rule. (Minimum 90 % of all DFT measurements shall be greater than or equal to the NDFT and none of the remaining 10 % measurements shall be below 0.9 x NDFT).

Maximum DFT 2000 µm is acceptable for isolated spots only, and should not extend to more than 1% of the total tank area.

PRIMARY SURFACE PREPARATION

Blasting and surface profile:
Cleanliness minimum Sa 2½ (ISO 8501-1)
Surface profile 30-75 µm (ISO 8503-2)

Blasting shall not be carried out when:

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- the relative humidity is above 85 %
- the surface temperature of steel is less than 3 °C above the dew point

Water soluble salts limit equivalent to NaCl
Maximum 50 mg/m² of sodium chloride (ISO 8502-6/9)

SECONDARY SURFACE PREPARATION

Steel condition
For steel preparation, PSPC makes reference to grade P2 (ISO 8501-3). All sharp edges are to be rounded to a radius of minimum 2 mm, subject to a three-pass grinding, or treated with an alternative process giving an edge profile that results in a dry film thickness retention corresponding to or better than a three pass grinding. Sharp edges mean all edges except natural rounded/rolled edges of sections.

Surface treatment
Cleanliness minimum Sa 2½ (ISO 8501-1) on damaged shop primer and welds.

Surface treatment after erection

Cargo oil tanks (COT), IMO Resolution MSC.288 (87)
Erection joints minimum St 3 or Sa 2½ (ISO 8501-1) where practicable.

For inner bottom:
- Damages up to 20 % of the area to be coated to be treated to minimum St 3
- Contiguous damages over 25 m² or over 20 % of the area to be coated, Sa 2½ shall be applied

For underdeck:
- Damages up to 3 % of area to be coated to be treated to minimum St 3
- Contiguous damages over 25 m² or over 3 % of the area to be coated, Sa 2½ shall be applied
- Coating in overlap shall be feathered

Profile requirements
In case of full or partial blasting surface profile 30-75 µm (ISO 8503-2).

Dust
Dust quantity rating 1 for dust size class 3 or larger (ISO 8202-3).
Lower dust size classes to be removed if visible without magnification on the surface to be coated.

Water soluble salts limit equivalent to NaCl after blasting/ grinding
Maximum 50 mg/m² of sodium chloride (ISO 8502-6/9).

Contamination
No oil contamination.
Inspect the surface for contaminations and if present, remove with an alkaline detergent. Agitate the surface to activate the cleaner and before it dries, wash the treated area by Low-Pressure Water Cleaning (LPWC) to Wa 1 (ISO 8501-4) using fresh water.

Ventilation
Sufficient ventilation must be provided to remove the solvent evaporating from the coating. When mixed, this product requires exchange of 56 m³ air per litre paint in order to dilute the evaporating solvent to a safe concentration in the tank (i.e. less than 10 % of the Lower Explosion Limit, LEL). The solvent gas concentration in the tank must at all times be kept below this level, hence sufficient ventilation must be maintained during the whole application and drying periods.

Environmental conditions
Coating shall be applied under controlled humidity and surface conditions, in accordance with the manufacturer's specifications. In addition, coating shall not be applied when:
- the relative humidity is above 85 %
- the surface temperature is less than 3 °C above the dew point
- the surface is wet or is likely to become wet

Testing of coating
Destructive testing should be avoided.
Dry film thickness shall be measured after each coat for quality control purposes. The total dry film thickness shall be documented after completion of the final coat, using appropriate thickness gauges.

This Application Guide supersedes those previously issued.
The Application Guide (AG) must be read in conjunction with the relevant specification, Technical Data Sheet (TDS) and Safety Data Sheet (SDS) for all the products used as part of the coating system.
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Repair and maintenance procedures relevant to coating according to Performance Standard for Protective Coatings (PSPC) of cargo oil tanks of crude oil tankers to IMO Resolution MSC.288(87)

Superficial damages not exposing bare substrate:
Prepare the area through sandpapering or grinding, followed by thorough cleaning/vacuuming. When the surface is dry and clean the coating may be over coated by itself or by another product, ref. original specification. Always observe the minimum and maximum over coating intervals. If the maximum over coating interval is exceeded the surface should be carefully roughened in order to ensure good intercoat adhesion.

Damages exposing bare substrate:
Choise of surface preparation and application methods shall be made in conjunction with Jotun and the actual Classification Society, following the guielines in:

MSC.1/Circ. 1399 (COT)
- Chapter 4.1 for coating condition assessment
- Chapter 5 for coating maintenance
- Chapter 6 for coating repair

Quality assurance

The following information is the minimum required. The specification may have additional requirements.

- Confirm that all welding and other metal work has been completed before commencing pre-treatment and surface preparation
- Confirm that installed ventilation is balanced and has the capacity to deliver and maintain the RAQ
- Confirm that the required surface preparation standard has been achieved and is held prior to coating application
- Confirm that the climatic conditions are within recommendations in the AG, and are held during the application
- Confirm that the required number of stripe coats have been applied
- Confirm that each coat meets the DFT requirements in the specification
- Confirm that the coating has not been adversely affected by rain or other factors during curing
- Observe that adequate coverage has been achieved on corners, crevices, edges and surfaces where the spray gun cannot be positioned so that its spray impinges on the surface at 90° angle
- Observe that the coating is free from defects, discontinuities, insects, abrasive media and other contamination
- Observe that the coating is free from misses, sags, runs, wrinkles, fat edges, mud cracking, blistering, obvious pinholes, excessive dry spray, heavy brush marks and excessive film build
- Observe that the uniformity and colour are satisfactory

All noted defects shall be fully repaired to conform to the coating specification.

Caution

This product is for professional use only. The applicator and operator shall be trained, experienced and have the capability and equipment to mix/stir and apply the coatings correctly and according to Jotun's technical documentation. Applicators and operators should use appropriate personal protection equipment when using this product. This guideline is given based on the current knowledge of the product. Any suggested deviation to suit the site conditions shall be forwarded to the responsible Jotun representative for approval before commencing the work.
For further advice please contact your local Jotun office.

Health and safety

Please observe the precautionary notices displayed in the container. Use under well-ventilated conditions. Do not inhale spray mist. Avoid skin contact. Spillage on the skin should immediately be removed with suitable cleanser, soap and water. Eyes should be well flushed with water and sought medical attention immediately.

Accuracy of information

Always refer to and use the current (last issued) version of the TDS, SDS and if available, the AG for this product. Always refer to and use the current (last issued) version of all International and Local Authority Standards referred to in the TDS, AG & SDS for this product.

Colour variation

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When applicable, products primarily meant for use as primers or antifoulings may have slight colour variations from batch to batch. Such products and epoxy-based products used as a finish coat may chalk when exposed to sunlight and weathering.

Colour and gloss retention on topcoats/finish coats may vary depending on type of colour, exposure environment such as temperature, UV intensity etc., application quality and generic type of paint. Contact your local Jotun office for further information.

Reference to related documents

The Application Guide (AG) must be read in conjunction with the relevant specification, Technical Data Sheet (TDS) and Safety Data Sheet (SDS) for all the products used as part of the coating system.

When applicable, refer to the separate application procedure for Jotun products that are approved to classification societies such as PSPC, IMO etc.

Symbols and abbreviations

min = minutes
h = hours
d = days
°C = degree Celsius
° = unit of angle
µm = microns = micrometres
g/l = grams per litre
g/kg = grams per kilogram
m²/l = square metres per litre
mg/m² = milligrams per square metre
psi = unit of pressure, pounds/inch²
Bar = unit of pressure
RH = Relative humidity (% RH)
UV = Ultraviolet
DFT = dry film thickness
WFT = wet film thickness

TDS = Technical Data Sheet
AG = Application Guide
SDS = Safety Data Sheet
VOC = Volatile Organic Compound
MCI = Jotun Multi Colour Industry (tinted colour)
RAQ = Required air quantity
PPE = Personal Protective Equipment
EU = European Union
UK = United Kingdom
EPA = Environmental Protection Agency
ISO = International Standards Organisation
ASTM = American Society of Testing and Materials
AS/NZS = Australian/New Zealand Standards
NACE = National Association of Corrosion Engineers
SSPC = The Society for Protective Coatings
PSPC = Performance Standard for Protective Coatings
IMO = International Maritime Organization
ASFP = Association for Specialist Fire Protection

Disclaimer

The information in this document is given to the best of Jotun's knowledge, based on laboratory testing and practical experience. Jotun's products are considered as semi-finished goods and as such, products are often used under conditions beyond Jotun's control. Jotun cannot guarantee anything but the quality of the product itself. Minor product variations may be implemented in order to comply with local requirements. Jotun reserves the right to change the data given without further notice.

Users should always consult Jotun for specific guidance on the general suitability of this product for their needs and specific application practices.

If there is any inconsistency between different language issues of this document, the English (United Kingdom) version will prevail.

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