Tankguard Special Topcoat

Product description

This is a two component polyamine cured phenolic/novolac epoxy coating. It has very good chemical resistance. To be used as topcoat in atmospheric and immersed environments. Suitable for approved primers only, refer to product compatibility later in this document.

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 in smooth 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.

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.

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.

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 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.

Coated surfaces

Organic primers/intermediates

This product is approved as a topcoat on a full Tankguard Special system. To be applied over Tankguard Primer/ Midcoat within the maximum overcoating interval specified.

Application

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 - 60	°C
Substrate temperature	5 - 60	°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

Product mixing

Product mixing ratio (by volume)

Tankguard Special Topcoat Comp A	3,7	part(s)
Tankguard Special Comp B	1	part(s)

Induction time and Pot life

Paint temperature	**23 °C**
Induction time	20 min
Pot life	3 h

Reduced at higher temperatures

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

Thinner/Cleaning solvent

Thinner: Jotun Thinner No. 23

Application data

Airless Spray Equipment

Pump ratio (minimum) :	42:1
Pump output (litres/minute) :	1.3-1.9
Pressure at nozzle (minimum) :	150 bar/2100 psi
Nozzle tip (inch/1000) :	17-21
Filters (mesh) :	70

Several factors influence, and need to be observed to maintain the recommended pressure at nozzle. Among factors causing pressure drop are:
- long paint- and whip hoses
- low inner diameter hoses
- high paint viscosity
- large spray nozzle size
- inadequate air capacity from compressor
- wrong or clogged filters

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	125	-	240	µm
Theoretical spreading rate	7,9	-	4,2	m²/l

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).

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 cm 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 solvent containing coating is applied in a confined space, for example a cargo tank, the solvent will evaporate and make an explosive atmosphere unless the solvent concentration is immediately reduced to a not-explosive level. Hence, artificial ventilation will be required. This ventilation must be maintained during the paint application and drying in accordance with the TDS data. The ventilation shall ensure that the solvent concentration in the tank at no time exceeds the maximum permitted (i.e. 0.1%).
Detailed background information about ventilation arrangements and calculations is given in the Code of Practice for Tank Coating, available at the TSS home page. There one will also find a “Ventilation calculator” that can be used for different coatings and thinners.

The Required Air Quantity (RAQ) is the amount of air needed to prevent that the solvent content of the drying paint makes the air explosive. For a typical tank coating the RAQ is 60 m³ of air per litre of paint. This means that for every litre of paint used one must ensure that this amount of air is made available so that the solvents in the paint can be diluted to a no longer dangerous concentration. If the paint is diluted with a thinner this will require additional fresh air. Thinner No. 23 requires 200 m³/litre.

Note that it is the responsibility of the Yard or Paint Application Contractor to ensure that there is a safe work environment in the tank. However, Jotun may assist in calculating RAQ, and design of the ventilation. Therefore, the Coating Advisor may be asked for advice.

The input of fresh air to the tank can be calculated provided the RAQ of the paint (and thinner, if used) is known :

Ventilation, m^3 air input per minute = [P*RAQA + Q*RAQB] / t
where

P = paint to be used in the tank, litres

Q = additional thinner used in this paint, litres

RAQA = RAQ, (m^3/l) for the paint

RAQB = RAQ, (m^3/l) for the thinner (if added)

t = (application + surface dry) time in minutes

Note that the ventilation fans must run until the coating is Through dry / Walk-on dry (cf. the TDS). The ventilation may run also after the coating is through dry, i.e. until the coating is cured. The need for ventilation is highest during the paint application process, when solvents evaporate both from the paint spray and the wet paint surface. When the coating is Surface (touch) dry the solvent evaporation rate is much lower and the fan speed may be reduced.

Example:
A 650 m^3 tank is coated with one coat of a 70 % VS tank coating, 125 µm DFT.
The tank has a calculated surface area of 1260 m^2.
The paint will be thinned 2 % (Thinner no. 23).
Application speed is 3.5 litres per minute.
How much fresh air must be blown into the tank per minute to eliminate the explosion risk?
The steel temperature is 23°C.

Answer: 125 µm/0.70 * 1260 m^2 = 225 litres of paint. 2 % to this is 4.5 litres thinner.

This requires 225*60 + 4.5*200 = 14400 m^3 fresh air. (225+4.5) litres / 3.5 litres sprayed per minute = 66 minutes application time.
Time to Surface dry (as per technical data sheet) is 4 hours at 23°C.
The average ventilation rate for the most demanding period is therefore 14400 m^3/ (66 +4*60) min = 47 m^3/ minute.

There is an alternative calculation of ventilation based on the "Number of air exchanges per hour" concept. In yard specifications one may, for example, find that during the paint application and drying, two or three air changes per hour in the tank is specified. This is a practical approach, but it does not take into account the solvent evaporation from the painting and drying process, and may lead to unsatisfactory results as to the elimination of the explosion risk.

As an example, using the figures above, one finds that "Three air exchanges per hour" corresponds to a ventilation rate of 3*650 m^3/hour = 33 m^3/minute.
In this case the alternative approach under estimates the ventilation requirement. A way to come around this is to increase the air exchange rate, or reduce the application speed.

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	10 °C	15 °C	23 °C	40 °C
Surface (touch) dry	16 h	10 h	5.5 h	2 h
Walk-on-dry	36 h	16 h	8.5 h	4 h
Dry to over coat, minimum	52 h	36 h	20 h	10 h
Dry to over coat, maximum, atmospheric	18 d	12 d	7 d	4 d
Dried/cured for service		14 d	7 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.

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 shortest time allowed before the next coat can be applied.

Dry to over coat, maximum, atmospheric: The longest time allowed before the next coat can be applied.

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

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 jetting to Wa 1 (ISO 8501-4) using fresh water.

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	10 °C	15 °C	23 °C	40 °C
Itself	18 d	12 d	7 d	4 d

Areas for immersed exposure

Average temperature during drying/curing	10 °C	15 °C	23 °C	40 °C
Itself	18 d	12 d	7 d	4 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. Feather edges and roughen the overlap zone of surrounding intact coating. Apply the coating system specified for repair.

Damages smaller than 5 cm^2:
Mechanical cleaning by abrasive sanding to a minimum St 3 (ISO 8504-3) with a rough surface profile.

Damages larger than 5 cm^2:
Dry abrasive blast cleaning to Sa 2½ (ISO 8501-1), preferably by the use of vacuum blasting equipment.

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.

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.

Repair of damaged areas

Sags and runs can be caused by too high wet film thickness, too much thinner added or the spray gun used too close to the surface.
Repair by using a paint brush to smooth the film when still wet.
Sand down to a rough, even surface and re-coat if the coating is cured.
Orange peel can be caused by poor flow/levelling properties of the paint, poor atomization of the paint, thinner evaporating too fast or the spray gun held too close to the surface.
This can be rectified by abrading the surface and applying an additional coat after having adjusted the application properties or the application technique.
Dry spray can be caused by poor atomization of the paint, spray gun held too far from the surface, high air temperature, thinner evaporating too fast or coating applied in windy conditions.
Sand down to a rough even surface and re-coat.
Pinholes can be caused by entrapped solvents in the film or by incorrect application technique. Pinholes can be repaired as per procedure for damages to the coating layer or to the substrate, ref. above.

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.

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 applicators and operators 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 shall 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 on 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 medical attention sought 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

Some coatings used as the final coat may fade and chalk in time when exposed to sunlight and weathering effects. Coatings designed for high temperature service can undergo colour changes without affecting performance. Some slight colour variation can occur from batch to batch. When long term colour and gloss retention is required, please seek advice from your local Jotun office for assistance in selection of the most suitable top coat for the exposure conditions and durability requirements.

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
TDS = Technical Data Sheet
AG = Application Guide

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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

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

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 given data 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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