

Tankguard Zinc

Product description

This is a two component moisture curing inorganic zinc ethyl silicate coating. It is a specially designed tank coating and lining with excellent cargo resistance. To be used as single coat system only, in atmospheric and immersed environments. Suitable for properly prepared carbon steel substrates. It can be applied down to +5 °C surface temperature. This product complies with ASTM D520 type II zinc dust.

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. Jotun's 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.

When preparing new substrates, maintaining already coated substrates or aged coatings it is necessary to remove all contamination that can interfere with coating performance, and prepare a sound surface for the subsequent product. Application of the protective coating shall commence before degradation of the surface occurs. Pure fresh water, if required with an alkaline detergent added, is suitable for general cleaning. Paint solvents (thinners) are not recommended for general degreasing or other surface preparation due to the risk of spreading soluble hydrocarbon contamination. Paint thinners can be used to treat small amounts of contamination such as dye penetration and marker pen inks. Use clean, white cotton cloths that are turned and replaced often. Do not bundle used solvent saturated cloths. Place used cloths into water.

Process sequence

It is important that all hot work on areas adjacent to the tank(s) is completed before coating application. Surface preparation and coating application to be done only after completed steel repairs (removal of sharp edges and weld spatter, welding or opening blow holes, and treatment of welds). To detect welding defects as early as possible, it is recommended to do a pre-blast of all welding seams, for pre inspection and possible correction.

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:

Potable water tanks: 20 mg/m²

Chemical tanks: 50 mg/m²

Carbon steel

Initial rust grade

The steel shall preferably be Rust Grade A or B according to ISO 8501-1. The use of Rust Grade C steel requires more thorough preparation work and possibly also more paint application in order to achieve the specified DFT. The risk of chloride contamination with Rust Grade C steel is significantly higher, so if steel of Rust Grade C is used the frequency of inspection and testing for chloride contamination on the surface should be increased and emphasized in the Inspection and Test Plan (ITP). Rust Grade D is not accepted.

Metal finishing

All welds, sharp edges and corners shall be prepared to conform to ISO 8501-3 Table 1 minimum grade P3 or NACE RP0178 grade C comparator. Defective welds shall be replaced and treated to an acceptable finish before painting. Temporary welds and brackets shall be ground to a flat finish after removal from the parent metal. All edges shall be treated to a rounded radius of minimum 2 mm, or subjected to three pass grinding or at least equivalent process. 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.

Abrasive blast cleaning

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

The surface shall have a sharp and angular surface profile 30-85 µm, grade Fine to Medium G (ISO 8503-2). Measure the achieved profile with surface replication tape (Testex) (ISO 8503-5) or by surface roughness stylus instrument (ISO 8503-4).

Abrasive media quality

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.

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 coating damage may be prepared to St 3 (ISO 8501) with minimum 25 µm surface profile corresponding to SSPC SP11. This method of preparation is only recommended for damages less than 20 cm² where abrasive blasting would make excessive damage to surrounding coatings. Edges of intact surrounding coating should be feathered to ensure a smooth coating overlap and a thorough vacuum cleaning of the area should be carried out.

Stainless steel

Passivation of steel:

Passivation of stainless steel parts and fittings must be done, before surface preparation of the carbon steel is initiated. All residues must be removed by fresh water cleaning.

Coated surfaces

Shop primers

Shop primers may have been used as temporary protection of the steel plates. Prior to application of inorganic zinc silicate the shop primer shall be removed by blast cleaning to Sa 2½ (ISO 8501-1) using abrasive media suitable to achieve a sharp and angular surface profile 30-85 µm grade Fine to Medium G; Ry5 (ISO 8503-2).

Inorganic zinc silicates

For maintenance and repair inorganic zinc silicate can be applied onto intact, clean and undamaged "old" inorganic zinc silicate substrates provided the over coating is done as per the Repair of coating system paragraph.

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 - 40	°C
Substrate temperature	5 - 40	°C

The following restrictions must be observed:

During the application process, the relative humidity shall be below 50%. During application of the main coat, the relative humidity may be allowed to increase up to 60% in order to get best possible application environment. As soon as the application of main coat is finished the relative humidity should be decreased to below 50%.

After application and DFT inspection is completed, the humidity shall be increased. The relative humidity should be raised to above 60% within 7 days of application of the full coat. The relative humidity must be sufficiently high so that enough water vapour is available for the curing process.

To avoid possible condensation on the bare steel before coating the steel temperature should be minimum 3 °C above the dew point.

The temperature in the pail will slightly affect the viscosity of the coating. Low temperature will increase the viscosity and high temperatures will reduce it. When working in hot climate the paint should be kept in a shaded and ventilated area, and not in direct sunlight. Paint temperature below 20 °C is preferable, because it will allow for optimal curing conditions, resulting in a longer touch up time and reduced dry spray.

Product mixing

Product mixing ratio (by volume)

Tankguard Zinc Comp A	3 part(s)
Jotun Zinc 100 Comp B	1 part(s)

Induction time and Pot life

Paint temperature	10 °C	15 °C	23 °C	30 °C	40 °C
Pot life	12 h	8 h	8 h	6 h	3 h

Pot life at lower temperature will increase slightly and at higher temperatures it will be slightly shorter. Pot life at lower humidity will increase slightly and at higher humidity it will be slightly shorter.

If the coating shows a significant increase in viscosity, poor flow or poor atomization, discard it and flush the equipment immediately with Jotun thinner No. 25. The pot life of the already mixed coating will not be prolonged by adding thinner or new coating material.

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. 25

Thinning may be required to adjust the spray pattern and for brush application. Thinning will lower the viscosity, which can reduce sag resistance. Thinning must be done with care as this will result in a lower attainable thickness. For the main coat maximum 5 % thinning is allowed. For touch-up / re-spray use up to 30 % depending on temperatures. High temperatures require more thinning than low temperatures.

Measure the thinner volume accurately with a measuring container and record the amount added for future reference. Always have sufficient tools available to be able to dismantle and clean out the application equipment in the event of blockages or an unplanned stop to the work.

When using airless spray or conventional air spray equipment, ensure the pump, pressure pot, lines and gun are fully flushed with thinner before and after spray application.

Spray application

Airless Spray Equipment

Pump ratio (minimum) :	42:1
Pressure at nozzle (minimum) :	100 bar/1400 psi
Nozzle tip (inch/1000) :	17-23
Nozzle output (litres/minute) :	1.3-2.2
Spray angle :	30-45°
Filters (mesh) :	Check to ensure that filters are clean.

Several factors influence, and need to be observed to maintain the recommended pressure at the nozzle. Among factors causing pressure drop are:

- extended hoses or hose bundles
- extended hose whip-end line
- small internal diameter hoses
- high paint viscosity
- large spray nozzle size
- inadequate air capacity from compressor
- incorrect or clogged filters

It is of vital importance that the nozzle and other parts of the spray equipment are cleaned properly directly after spraying before the coating cures inside the equipment.

Hoses should be of good quality, clean and as short as possible.

Increasing hose diameter may ease paint flow thereby improving the spray fan with good atomization. If longer hoses are used it may be necessary to increase the pump capacity/pressure. Maximum hose length and hose diameter limits are also temperature dependent. Hose/pressure and pump capacity limits are influenced by gravitation force on the coating in the hose, which is affected by the elevation of the spray gun above the pump.

Plural component (Twin Pump) airless spray equipment

Due to the metallic powder nature of component B the product cannot be applied by plural component spray equipment.

Spray application technique

In order to achieve an even film, pay close attention to spraying technique and equipment settings. A combination of the correct inbound air and outbound material pressure, correct nozzle size and a 30-50 cm gun-to-substrate distance is recommended. Apply the coating with even and uniform parallel passes and overlap each pass 50 %. It is difficult to measure the wet film of zinc silicates as the metallic content and the quick hardness of the film will have an impact on measurement. Still it is recommended to use wet film combs during application to control the thickness of the coating.

As this is an ethyl silicate based coating it needs humidity to cure.

Practically this requires the following considerations:

Achieving the correct dry film thickness:

Correction of low DFT areas is recommended to perform before curing of the coating is initiated.

After application, minimum 2 hours of good ventilation should be provided and if touch-up/re-spray is required, after completed application, good ventilation for 2 hours should be provided again prior to increasing the humidity.

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	75 - 170	µm
Wet film thickness	110 - 250	µm
Theoretical spreading rate	8.9 - 3.9	m ² /l

The above minimum and maximum dry film thickness ranges indicate what is an acceptable dry film thickness reading. However, the average dry film thickness of the entire area should be between 90-140 μm . As this is a one coat system, the actual minimum dry film thickness should be adjusted according to the actual obtained blasting profile. In case the blasting profile is in the high end of the interval 30-85 μm , the minimum dry film thickness reading should be adjusted upwards accordingly. Particular attention must be paid to control of curing at DFTs above 140 μm .

Film thickness measurement

The values are recommended so as to ensure opacity and minimize the risk of cargo retention. They are not meant to be pass / fail criteria for e.g. DFT evaluation. If the steel roughness is in the upper band ($\sim 85 \mu\text{m}$) a higher DFT than 75 μm should be contract specified.

Particular attention must be paid to control of curing at DFTs above 140 μm .

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). Use a wet-to-dry film calculation table to calculate the required wet film thickness per coat.

A wet to dry film thickness chart is available on the Jotun Web site.

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.

Minimum thickness

Dependent on the steel roughness dry film thickness below 75 μm may result in a non-coherent film. Hence, the general recommendation is to specify 100 μm DFT and apply the 90/10 rule for low thickness areas.

Maximum thickness

The usual specified dry film thickness is 100 μm . Tankguard Zinc has good mud cracking resistance, but total dry film thickness readings above 170 μm should be kept to an absolute minimum. Dry film thickness exceeding this level may be retrospectively reduced by hand sand papering or using orbital (not rotary) power tools fitted with soft backing pads (beneath the sandpaper discs).

As the range of acceptable dry film thickness is very narrow, it is very important that the equipment used for measuring dry film thickness is properly calibrated and has a valid calibration certificate.

Calibration of equipment can either be done on zero plate or by calibrating on the blasted surface. In case of calibration on zero plate, the roughness of the steel has to be taken into consideration, when measuring the dry film thickness.

Application / Drying / Curing considerations

An inorganic zinc coating needs humidity during curing in order to ensure proper crosslinking in the film. Proper curing is achieved by ensuring that a relative humidity above 60 % is maintained in the tank until the completed curing has been verified. At lower temperatures relative humidity must be increased to ensure complete curing.

In order not to retard the curing, the extraction hose should be close to the bottom of the tank (50~100 cm above the tank top). Ventilation air (input) should be organised in a way so all parts of the tank are well circulated.

Test of curing:

Before overcoating the applied coating must be visibly dry and tested for sufficient curing. Curing shall always be tested for resistance to MEK, Methyl Ethyl Ketone (ASTM D 4752). The test result should as a minimum equal Resistance Rating 4; "Burnished appearance in rubbed area; slight amount of zinc on cloth after 50 double rubs". The MEK test measures curing in the surface of the primer.

Ventilation

When Tankguard Zinc is applied in a confined space, its solvent will evaporate and produce an explosive atmosphere unless solvent concentration is immediately reduced to a non-explosive level, therefore forced ventilation is 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.

After application it is recommended to increase the ventilation (see later in this document) as long as solvent is released from the uncured film. This is usually 10 % of the product's Lower Explosive Limit.

As a guideline for good ventilation, after application the confined space should be ventilated with 3-5 cycles per hour for 12 hours and can be reduced to 1 cycle per hour until coating is fully cured.

As solvent is heavier than air and will tend to accumulate in the lower areas of tanks, ventilation system and trunking must be arranged to efficiently remove solvent vapour from these areas.

The extraction hose should be close to the bottom of the tank (approximately 50~100 cm above the tank top). Ventilation air (input) should be organised in a way so all parts of the tank are well circulated.

Stripe coating

Depending on the size of the tank(s), the sequence can be either of the following:

1. Surface preparation, stripe coat, full coat, curing, final touch-up by brush (minor areas or small tanks). Touch-up application should be done simultaneously with application of the full coat in order to maximise wet-on-wet application.
2. Surface preparation, full coat with stripe coat and touch-ups, curing, final touch-up by brush (minor areas). Touch-up application should be done simultaneously with application of the full coat in order to maximize wet-on-wet application of the touch-ups. This method may be acceptable for large surface areas where leaving the blasted surface exposed for a long period during stripe coating could result in loss of blast standard due to the steel oxidising.

The above should be clarified during the kick off meeting.

It is important to pay special attention to edges, openings, rear sides of stiffeners, scallops, and any places where the spray fan may not deposit an even film by applying a stripe coat. When applying stripe coats to bare metal use only stiff brushes to ensure surface wetting and filling of pits in the surface. If applying a stripe coat after the full coat has been applied, it may be applied by brush.

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	1 h	45 min	45 min	30 min	27 min	20 min
Walk-on-dry	1.5 h	1 h	1 h	45 min	35 min	30 min
Dried/cured for service	8 d	6 d	96 h	48 h	34 h	18 h
Dried/cured for immersion	5 d	3 d	60 h	36 h	27 h	16 h

The given drying and curing times are measured at relative humidity (RH) 80 % during curing. Higher RH will increase, and lower RH will reduce the curing speed.

Close control of the tank atmosphere temperature and relative humidity shall be exercised during the whole application, drying and curing period. It is important the relative humidity is maintained during application and for a time until inspection is carried out and DFT is approved. When the coating film is approved, the humidity shall be increased and depending on the surface temperature be maintained for a period of time as mentioned above. It may also be done when the coating is fully cured, however if zinc salts have formed on the surface they must be carefully removed first. For touch up on a cured coating, 15 % Jotun Thinner No. 25 should be added.

Ventilation (circulation of humid air) shall be provided to ensure that all surfaces are properly exposed to high humidity.

The relative humidity (RH) shall be minimum 60 % at 23 °C during curing in order to secure a proper cure. At lower temperatures relative humidity must be increased to ensure complete curing. Ventilation shall be provided to ensure that all surfaces are properly exposed to the high humidity air.

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.

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

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

Other conditions that can affect drying / curing / over coating

Repair of coating system

In case there are areas of low film thickness, the film thickness should be built up during a period where the relative humidity is kept below 50%. The maximum re-coating window is 3 days between coats, however an area can be applied several times, as long as the maximum over coating interval is kept and the DFT is within the given maximum range, for examples supports or other areas difficult to reach can be applied 2-3 times with a one-two days over coating interval. For touch-up/ respray thinning with 30% Jotun Thinner No. 25 is recommended.

When the application is completed the coating should be exposed to high humidity, hence the relative humidity should be increased to a minimum of 60% and kept there until the coating is fully cured. The increase of relative humidity must be done within 7 days of the application of main coat.

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

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

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.
