Havforskningsinstituttet – Rederiavdelingen

Fartøy: **Dr. Fridtjof Nansen**

VERKSTEDSJOBBER/ DOKKING

Jobb : 01 **Dato utført :** **Sign :**

Konto nr : **Lokalitet/plassering :**

Komponent: Sandblåsing og maling av ferskvannstanker

JOBB INFORMASJON/ DETALJER		INKLUDERT I ARBEID
Sandblåsing og maling av fem (5) ferskvannstanker om bord, se tank plan (460-101-007); • Tank nr. 300 babord • Tank nr. 300 styrbord • Tank nr. 810 C • Tank nr. 310 babord • Tank nr. 310 styrbord. Arbeidet skal utføres i henhold til teknisk spesifikasjon fra Jotun, se vedlagt. Spesifikasjonen skal gjennomgås og godkjennes av representant fra Jotun i god tid før oppstart av arbeidet. Representant fra Jotun (malingsinspektør) skal være tilstede under utførelsen av arbeidet og skal kontrollere og føre tilsyn med nødvendige forberedelser, sandblåsing, maling, tørking og rengjøring av tankene. Ferskvannstankene skal være klare til bruk ved levering etter endt verkstedsopphold. Maling vil leveres av oppdragsgiver.		
		Gassfri sertifikat
		Ekstra belysning
		Ventilasjon
	x	Tilkomst
		Rengjøring før
	x	Rengjøring etter
		Stillas
		Krane
		Transport til verksted
		Transport ombord
	x	Sandblåsing
	x	Priming/Grunning
	x	Maling
		Trykk/Vacuum testing
		X-ray
		Ultrasonic testing
		Brannvakt/Sikkerhetsvakt
		Isolasjonstest/Megging
		Rette opp tegninger
		ARBEIDET SKAL KONTROLL. AV:
	x	Klasse (DnV)
	x	Teknisk inspektør
		Kaptein/Maskinsjef
	x	Utstyrs leverandør
		MATERIAL:
	x	Verksteds levering
	x	Rederi levering
		VEDLEGG:
		Foto
		Tegning
		Skisse
		Eksempel/Prøve

Jotspec

Technical specification

Dry Dock

Owner:		**Vessel name:**	DR. FRIDTJOF NANSEN		
Yard:		**IMO:**	9762716	**Version:**	1
Management:	HAVFORSKNINGSINSTITUTTET	**Hull no:**	460	**Date:**	14.02.2020
Project:	DR. FRIDTJOF NANSEN REPAIR OF FW TANKS 2020				
Prepared by:	Vidar Oldervik - Jotun Coatings				

Technical specification

Project	DR. FRIDTJOF NANSEN REPAIR OF FW TANKS 2020	**Prepared by**	Vidar Oldervik - Jotun Coatings		
Customer	HAVFORSKNINGSINSTITUTTET	**Approved by**	Technical sales support	**Version**	1
Location				**Date**	14.02.2020

Position	**Fresh water tanks (drinking water / potable water)**	**Area**	10 m²	**No.**	1
Surface Prep.	Oil and grease etc. to be removed with a suitable detergent. The entire area to be high pressure fresh water washed at min. 350 bar in order to remove salts (max. 50 mg/m²) and other contamination. When the surface is dry the entire area with is to be blast cleaned to min. Sa. 2 1/2 (ISO 8501).				

Product	Type of coat	Area to paint %	Vol. solids %	Filmthickness (µm)		Loss (%)	Recoating intervals						Thinner		Consumption (l)	
							10°C		23°C		40°C					
				Dry spec.	Wet spec.		Min	Max	Min	Max	Min	Max	No.	Max %	Theor.	Practical
TANKGUARD DW,LIGHT GREY	FC	100	100	200	200	30	25 h	10 d	13 h	5 d	5 h	3 d		0	2	3
TANKGUARD DW,WHITE	FC	100	100	200	200	30	25 h	*	13 h	*	5 h	*		0	2	3
			Total	400												

Remarks: The Application Guide (AG) for the product shouldt 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. AG/TDS should be followed strictly during the process.

After the coating is fully cured;and before the tank is taken into use for potable water it should be thoroughly cleaned according to "WASHING PROCEDURES FOR POTABLE WATER TANKS" stated in TDS and the Certificate for the product.

Before every full coat;a stripe coat;should be applied by brush on all edges;corners;welding seams and other areas difficult to reach;in order to build up the dry film thickness on these areas. Brush should be used on welding seams;edges and corners. Rollers must only be used for scallops and ratholes.

* please refer to the relevant technical datasheets and AG application guide for recoating and curing conditions

NR: Not recommended for this exposure or generic type:

Tankguard DW

Product description

This is a two component solvent free amine cured epoxy coating. It is specially designed for drinking water tanks. Can be used as primer and finish coat in atmospheric and immersed environments. Suitable for properly prepared carbon steel, stainless steel, aluminium, composites and concrete substrates.

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.

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 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 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:
Potable water tanks: 50 mg/m²

Carbon steel

Initial rust grade

The steel shall preferably be Rust Grade A or B (ISO 8501-1). It is technically possible to apply the coating to rust grades C and D, but it is practically challenging to ensure specified film thickness on such a rough surface, hence risk of reduced lifetime of the coating system. When steel of Rust Grade C or D is coated, the frequency of inspection and testing should be increased.

Metal finishing

For areas in corrosivity category C1 to C4 (ISO 12944-2) all irregularities, burrs, slivers, slag and spatter on welds, sharp edges and corners shall conform to minimum grade P2 (ISO 8501-3) Table 1, or as specified. All edges shall have a rounded radius of minimum 2 mm subjected to three pass grinding or equally effective method.

For areas in corrosivity category C5 and Im1-3 the requirement are for the steel to conform to grade P2 (ISO 8501-3) Table 1. All edges shall have a rounded radius of minimum 2 mm subjected to three pass grinding or equally effective method. 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.
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.

Surface preparation and coating should normally be commenced only after all metal finishing and degreasing of a specific area is complete. It is important as much hot work as possible is completed before coating commences.

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

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.

Aluminium

Abrasive blast cleaning

After removal of surface defects the area to be coated shall be degreased to ISO 12944-4, Part 6.2.4 Alkaline Cleaning. The surface shall be sweep blast-cleaned with the nozzle angle at 45-60° from perpendicular at reduced nozzle pressure to create a sharp and angular surface profile using approved non-metallic abrasive media. As a guide, a surface profile 25-55 µm, grade Fine G; Ry5 (ISO 8503-2) should be achieved. Alternatively refer to NACE no. 4/SSPC-SP7.
Smaller areas can be lightly treated with abrasive paper.
Finished surfaces shall be dull, profiled and show no areas of shiny metal.
Do not handle the prepared surface with bare hands.

Hand and Power Tool Cleaning

After removal of surface defects the area to be coated shall be degreased to ISO 12944-4, Part 6.2.4 Alkaline Cleaning, and the surface abraded using mechanical or hand sanding methods using non-metallic abrasives or bonded fibre abrasive pads to remove all polish and to impart a scratch pattern to the surface. Do not use high speed rotational sanders.

Stainless steel

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

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

Concrete

Concrete should be a minimum of 28 days old, applying any coating before this time will greatly increase the chance of the coating de-bonding. The moisture content of the concrete should be checked prior to the application of the coating and should not be greater than 5%. Concrete substrates should be mechanically prepared to leave a clean, sound and dry base on which a coating system can be applied.
Clean – Free of oils, grease, dust, dirt, chemicals, loose coating, curing compounds, form release oils, sealers or hardeners.
Sound – Concrete that has unsound areas (voids, hollow spots, and friable surface) may have to be removed, replaced or repaired with materials that are compatible with the selected coating system.
Dry – It is important to address dryness because most coatings require a dry surface for proper adhesion. Moisture contained within the concrete that moves towards the surface through the pores of the concrete may prevent adequate coating adhesion.
Dry abrasive blast cleaning to SSPC-SP 13/NACE No. 6. Where the concrete has become contaminated with oils, grease, or fuels, water emulsifiable degreasers-cleaners may be used to remove these contaminants. It is important to only clean an area that can be fully washed down after degreasing before any of the cleaner can dry on the surface.
Ultra high pressure water jetting can be used to remove laitance and reveal blowholes and imperfections. Ensure concrete is dry before coating application.

Sand sweeping

Dry abrasive blast cleaning to SSPC-SP 13/NACE No. 6. All prepared surfaces should then have all "blow holes" and other surface defects filled with suitable filler that is compatible with the primer and finish coat system to ensure that the coating can be applied over a smooth and regular substrate.

Diamond disc grinding

Diamond grind the surface to remove all laitance and expose the aggregates.

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).

Other surfaces

Composite
Polyester based composites must be fully cured before initiating the surface preparation.
The substrate should be thoroughly cleaned with an alkaline detergent to remove traces of oil, grease, mould release agents or other contaminants. The surface should be abraded using a medium to fine abrasive paper (grade P80-P120) to impart a scratch pattern to the surface. All dust must be thoroughly removed from the substrate. It is important that the composite material is fully cured before application of the coating system.

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	10 - 50	°C
Substrate temperature	10 - 60	°C
Relative Humidity (RH)	10 - 60	%

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 DW Comp A	2 part(s)
Tankguard DW Comp B	1 part(s)

Induction time and Pot life

Paint temperature	23 °C
Induction time	5 min
Pot life	30 min

Reduced at higher temperatures

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

Thinner/Cleaning solvent

Do not add thinner.

Cleaning equipment
Prior to application: Jotun Thinner No. 28
After application: Jotun Thinner No. 17

Application data

Spray application

Airless Spray Equipment

Pump ratio (minimum) :	64:1
Pressure at nozzle (minimum) :	175 bar/2500 psi
Nozzle tip (inch/1000) :	19-25
Nozzle output (litres/minute) :	1.5-2.6
Filters (mesh) :	50-70

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

Plural component (Twin Pump) airless spray equipment

Using two-component pump is highly recommended in order to achieve an optimum spray pattern, especially during application at lower temperatures. When applying at higher temperatures use of two-component pump eliminates the challenge with reduced pot life.

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.

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	150	-	400	µm
Wet film thickness	150	-	400	µm
Theoretical spreading rate	6.7	-	2.5	m²/l

Can be applied up to 25 % higher than maximum specified film thickness without loss of technical properties.

Film thickness measurement

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

As a guideline for good ventilation, after application of each coat the confined space should be ventilated corresponding to minimum 3 exchanges of air per hour. After final coat maintain minimum 3 exchanges of air per hour for at least 48 hours. Thereafter the number of air exchanges can be reduced to 1 per hour until the coating is dried/cured for service.

For more detailed information reference is made to Jotun's General Tank Coating Code of Practice.

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.

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	23 °C	40 °C
Surface (touch) dry	15 h	10 h	3 h
Walk-on-dry	25 h	13 h	5 h
Dry to over coat, minimum	25 h	13 h	5 h
Dried/cured for service	14 d	7 d	4 d

Drying and curing times are determined under controlled temperatures and relative humidity below 60 %, 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 recommended shortest time 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 cleaning 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	23 °C	40 °C
Itself	10 d	5 d	3 d

Areas for immersed exposure

Average temperature during drying/curing	10 °C	23 °C	40 °C
Itself	10 d	5 d	3 d

Other conditions that can affect drying / curing / over coating

Repair of coating system

Damages to the coating layers:
Prepare the area through sandpapering or grinding, followed by thorough cleaning/vacuuming. When the surface is clean and dry the coating may be over coated by itself or by another product, ref. original specification.
Always observe the 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.

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.

Surface finish

Amine sweating may occur when amine cured epoxy coatings are cured at low temperatures and/or humid conditions. Amine sweating can sometimes be observed on the surface as a sticky residue or as discolouration. It can seriously affect the adhesion of the subsequent coat and must be removed. If amine sweating is suspected, wash the surface with warm water and detergent, and rinse thoroughly with water. Light abrasion of the surface and removal of dust before over coating will further secure good intercoat adhesion.
Amine sweating can be minimized by observing the induction time stated in TDS.

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
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 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.

Tankguard DW

Product description

This is a two component solvent free amine cured epoxy coating. It is specially designed for drinking water tanks. Can be used as primer and finish coat in atmospheric and immersed environments. Suitable for properly prepared carbon steel, stainless steel, aluminium, composites and concrete substrates.

Typical use

To be used as a coating for potable water tanks and pipes. Independently tested and certified for potable water storage.

Approvals and certificates

Approved to BS 6920-1:2000 for contact with potable water.
Approved by the Norwegian Institute of Public Health for use in contact with potable water.
In compliance with Federal Drug Authority, USA, FDA Title 21, Part 175.300, approved for exposure to dry foods
Meets the requirements of ANSI/AWWA standard C210-07. Suitable for water pipelines.

Additional certificates and approvals may be available on request.

Colours

light grey, white

Product data

Property	Test/Standard	Description
Solids by volume	ISO 3233	100 %
Gloss level (GU 60 °)	ISO 2813	gloss (70-85)
Flash point	ISO 3679 Method 1	100 °C
Density	calculated	1.4 kg/l
VOC-US/Hong Kong	US EPA method 24 (tested) (CARB(SCM)2007, SCAQMD rule 1113, Hong Kong)	3 g/l
VOC-EU	IED (2010/75/EU) (theoretical)	2 g/l
VOC-China	GB/T 23986-2009 (tested)	21 g/l
VOC-Korea	Korea Clean Air Conservation Act (tested)	2 g/l

The provided data is typical for factory produced products, subject to slight variation depending on colour.
All data is valid for mixed paint.
Gloss description: According to Jotun Performance Coatings' definition.

Film thickness per coat

Typical recommended specification range

Dry film thickness	150	-	400	µm
Wet film thickness	150	-	400	µm
Theoretical spreading rate	6.7	-	2.5	m²/l

Surface preparation

To secure lasting adhesion to the subsequent product all surfaces shall be clean, dry and free from any contamination.

Surface preparation summary table

Substrate	Surface preparation	
	Minimum	Recommended
Carbon steel	Sa 2½ (ISO 8501-1)	Sa 2½ (ISO 8501-1)
Stainless steel	The surface shall be hand or machine abraded with non-metallic abrasives or bonded fibre machine or hand abrasive pads to impart a scratch pattern to the surface.	Abrasive blast cleaning to achieve a surface profile using non-metallic abrasive media which is suitable to achieve a sharp and angular surface profile.
Aluminium	The surface shall be hand or machine abraded with non-metallic abrasives or bonded fibre machine or hand abrasive pads to impart a scratch pattern to the surface.	Abrasive blast cleaning to achieve a surface profile using non-metallic abrasive media which is suitable to achieve a sharp and angular surface profile.
Composite	The surface shall be hand or machine abraded to impart a scratch pattern to the surface.	The surface shall be hand or machine abraded to impart a scratch pattern to the surface.
Concrete	Dry abrasive blast cleaning to SSPC-SP 13/NACE No. 6.	Dry abrasive blast cleaning to SSPC-SP 13/NACE No. 6.

Optimum performance, including adhesion, corrosion protection, heat resistance and chemical resistance is achieved with recommended surface preparation.

Application

Application methods

The product can be applied by

Spray:	Use airless spray.
Brush:	Recommended for stripe coating and small areas. Care must be taken to achieve the specified dry film thickness.
Roller:	Roller application only to be used for scallops, ratholes, small pipes etc.

Product mixing ratio (by volume)

Tankguard DW Comp A	2 part(s)
Tankguard DW Comp B	1 part(s)

Thinner/Cleaning solvent

Do not add thinner.

Cleaning equipment
Prior to application: Jotun Thinner No. 28
After application: Jotun Thinner No. 17

Guiding data for airless spray

Nozzle tip (inch/1000):	19-25
Pressure at nozzle (minimum):	175 bar/2500 psi

Drying and Curing time

Substrate temperature	10 °C	23 °C	40 °C
Surface (touch) dry	15 h	10 h	3 h
Walk-on-dry	25 h	13 h	5 h
Dry to over coat, minimum	25 h	13 h	5 h
Dried/cured for service	14 d	7 d	4 d

For maximum overcoating intervals, refer to the Application Guide (AG) for this product.

Drying and curing times are determined under controlled temperatures and relative humidity below 60 %, 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 recommended shortest time 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.

Induction time and Pot life

Paint temperature	23 °C
Induction time	5 min
Pot life	30 min

Reduced at higher temperatures

Heat resistance

	Temperature	
	Continuous	**Peak**
Dry, atmospheric	120 °C	140 °C
Immersed, sea water	50 °C	60 °C

Peak temperature duration max. 1 hour.

The temperatures listed relate to retention of protective properties. Aesthetic properties may suffer at these temperatures.

Note that the coating will be resistant to various immersion temperatures depending on the specific chemical and whether immersion is constant or intermittent. Heat resistance is influenced by the total coating system. If used as part of a system, ensure all coatings in the system have similar heat resistance.

Product compatibility

Depending on the actual exposure of the coating system, various primers and topcoats can be used in combination with this product. Some examples are shown below. Contact Jotun for specific system recommendation.

Subsequent coat: itself only

Additional information

WASHING PROCEDURES FOR POTABLE WATER TANKS:

After the coating is fully cured, and before the tank is taken into use for potable water it should be thoroughly cleaned.

The letter of approval from the Norwegian Institute of Public Health specifies several possible procedures. Alternatively, one of the following procedures may be employed:

- High pressure fresh water washing using a temperature of minimum 30 °C.
- Steam cleaning.
- Manually scrubbing the tank with warm water and an alkaline detergent.

Afterwards the tank surfaces should be flushed with clean fresh water.

For the BS6920 certificate there is no specific requirements to cleaning procedure, the only requirement is that the coating is properly cured and the tank cleaned preferably with fresh water before the tank is taken into use.

On completion of the washing the tank shall be emptied of water by pumping. The remaining water after pumping shall be removed by the use of towels and rags in order to ensure that contaminants are removed. Evaporation will only concentrate remaining contaminants.

Please contact Jotun's local technical service team for further information, or refer to the Application guide.

Packaging (typical)

Volume (litres)	**Size of containers (litres)**

Tankguard DW Comp A	10	20
Tankguard DW Comp B	5	5

The volume stated is for factory made colours. Note that local variants in pack size and filled volumes can vary due to local regulations.

Storage

The product must be stored in accordance with national regulations. Keep the containers in a dry, cool, well ventilated space and away from sources of heat and ignition. Containers must be kept tightly closed. Handle with care.

Shelf life at 23 °C

Tankguard DW Comp A	12 month(s)
Tankguard DW Comp B	12 month(s)

In some markets commercial shelf life can be dictated shorter by local legislation. The above is minimum shelf life, thereafter the paint quality is subject to re-inspection.

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.

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.

Colour variation

When applicable, products primarily meant for use as primers or antifoulings may have slight colour variations from batch to batch. Such products may fade and 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., and application quality. Contact your local Jotun office for further information.

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.

Norwegian Institute of Public Health

Jotun A/S
Thoralv Undrum
P.O.Box 2021
3202 SANDEFJORD

Our ref: 08/2545-31/MIME/INST
Date:20.12.2011

APPROVAL OF THE EPOXY COATING TANKGUARD DW FOR USE IN DRINKING WATER TANKS ON SHIPS AND OFFSHORE INSTALLATIONS

We refer to your e-mail dated November 25, 2011, concerning approval of the epoxy coating Tankguard DW for use in drinking water tanks on ships and offshore installations.

General information about toxicological evaluation/approval of products in contact with drinking water

The Norwegian Institute of Public Health, Division of Environmental Medicine, has the authority to approve products (coatings, additives, etc.) in contact with drinking water on installations/ships offshore (The Ministry of Labour and Government Administration; Regulations of 31st of August 2001, and The Ministry of Trade and Industry; Regulations of 4th of September 1987).

According to The Ministry of Health and Care Services; Regulations of 1st of January 2002, concerning drinking water supply and drinking water onshore, approvals of additives for use in contact with drinking water are required. Such additives are regulated by the Food Act, which is administered by the Norwegian Food Control Authority or by the local Norwegian health and food control authorities. The Norwegian Institute of Public Health, Division of Environmental Medicine, performs toxicological evaluations of such additives for the Norwegian Food Control Authority, as well as of materials which may come in contact with drinking water onshore. The Norwegian Institute of Public Health does not approve products for use in contact with drinking water onshore.

The manufacturer and/or the importer of such products are responsible for producing the products according to good manufacturing practice and for the quality of the products. The content of impurities and the migration of components directly or indirectly from such products to drinking water should be as low as technically possible. Furthermore, the migrating substances should not pose any risk to human health. **Please be aware that problems with flavour and odour and too high values of TOC may easily occur if proper procedures for curing and washing are not followed. Therefore, the instructions from the producer must be strictly followed to avoid such problems.**

Approvals of Tankguard DW for use in contact with drinking water on ships and offshore installations

The Norwegian Institute of Public Health has evaluated Tankguard DW on the basis of the product information provided by Jotun AS and results of tests for TOC, flavour and odour performed by Norner AS, and finds the coating **approved** for use in drinking water tanks on ships and offshore installations. This approval is not valid for use in pipes and only for use in contact with cold water.

Norwegian Institute of Public Health
P.O.Box 4404 Nydalen
NO-0403 OSLO, Norway

Lovisenberggata 8
Tel: +47 21 07 70 00
Fax: +47 22 35 36 05

folkehelseinstituttet@fhi.no
www.fhi.no
NO 983 744 516

Division of Environmental Medicine
Department of Food Safety and Nutrition
Direct line: Inger-Lise Steffensen, +47 21 07 65 30

Premises for this approval are that:

- **the producer's recommendations for use of the coating are followed accurately, particularly the number of coatings, their thickness, and curing conditions which include at least 7 days at 23°C or higher temperature.**

- **after being fully cured the coatings should be thoroughly cleaned after one of the following washing procedures, or by another adequate procedure recommended by the producer, before being used in contact with drinking water:**

  1. **The tank is filled with hot water (>60 - 80°C), which are left for 24 hours before it is emptied. Thereafter, the tank is thoroughly cleaned with hot water (80°C) and scrubbed with a brush or washed with steam before being used.**

  or

  2. **The tank is filled with hot air, minimum 23°C for at least 7 days. Thereafter, the tank is filled 3 times with warm water (minimum 50°C), each filling is left to stand in the tank for 24 hours. Thereafter, the tank is thoroughly cleaned with warm water (50°C) and scrubbed with a brush or washed with steam before being used.**

  If it is difficult to employ these preferred procedures, for instance if the tank is very large (>100 000 litres) making filling and emptying impractical, this alternative procedure may be used:

  3. **The whole coating is irrigated with water (preferably with a temperature of more than 15°C) for 2 days. Thereafter, the tank is thoroughly cleaned with soap and hot water (80°C) and scrubbed with a brush or washed with steam before being used.**

- **the instructions for the washing procedures are included in the Technical data sheet for the product**

- **the product does not affect the quality of the drinking water.**

Conclusion:
The Norwegian Institute of Public Health finds Tankguard DW approved for use in drinking water tanks on ships and offshore installations provided that the curing conditions include at least 7 days at 23°C or higher temperature.

This approval is based on the product information given in the application and today's knowledge. If essential changes are made in the formulations, this approval will be annulled automatically and new application is necessary. Also, if the basis for our approval of health effects is changed, the approval will be revoked.

This approval is restricted to the effects on human health. It is otherwise no guarantee for the quality of the products and they should not be used in advertisements in a way that gives such an impression (Norwegian Marketing Regulation, Law no. 2, 9th of January 2009).

Charge of payment will be claimed according to Norwegian Occupational Environmental Laws §18 for products used on ships and offshore.

Yours sincerely,

Helle Margrete Meltzer
Department Director, PhD

Inger-Lise Steffensen
Senior Scientist, PhD