

## Hardtop WF

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### Product description

This is a two component waterborne chemically curing aliphatic acrylic polyurethane coating. It is a versatile product for exterior use. It has a glossy finish with very good gloss retention. It has good chemical resistance. The product has good application properties with low dry spray. It is part of a complete waterborne system with a recommended Jotun waterborne primer or as a part of a hybrid system with suitable solvent borne primer.

### 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.

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### 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. Use clean, white cotton cloths with deionized water and replaced often. Solvent is not allowed. Place used cloths into water.

### Coated surfaces

#### Verification of existing coatings including primers

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.

#### Organic primers/intermediates

The surface of previous coats shall be free from contamination by water, hydrocarbon based products, wax, mud, mortar droppings and loose, chalked and flaking coating. Inspect the surface for hydrocarbon and other contamination and if present, remove with an alkaline emulsifying detergent. Agitate the surface to activate the cleaner and before it dries, wash the treated area by low-pressure water cleaning (ISO 8501-4) using fresh water. Surfaces not contaminated with hydrocarbon deposits shall be washed according to ISO 12944-4, section 6.2.1 Water cleaning using fresh water to reduce surface chlorides. When applied on coatings past maximum over coating interval light abrading may be required to achieve proper intercoat adhesion.

## Application

### Environmental conditions

The suitable humidity range is 40-70 %, and 80 % of RH is the upper limit. If humidity is below 40 %, humidification is recommended. When the surrounding relative humidity exceeds 70 %, no water should be added. If necessary, the amount of water allowed to add is maximum 5 %.

### 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 - 35 | °C |
| Substrate temperature  | 10 - 35 | °C |
| Relative Humidity (RH) | 30 - 80 | %  |

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
- Do not apply the coating if the weather is clearly deteriorating or unfavourable for application or curing

When the substrate temperature exceeds 40 °C no application is recommended. Application in direct sun light shall be avoided.

For further advice please contact your local Jotun office.

## Product mixing

### Product mixing ratio (by volume)

|                   |           |
|-------------------|-----------|
| Hardtop WF Comp A | 5 part(s) |
| Hardtop WF Comp B | 1 part(s) |

### Induction time and Pot life

| Paint temperature | 10 °C | 23 °C | 35 °C  |
|-------------------|-------|-------|--------|
| Pot life          | 3 h   | 2 h   | 80 min |

If pot life is exceeded the residue in the can should be discarded as the long-term properties may have been impaired, even if it does not show obvious change in viscosity.

### Thinner/Cleaning solvent

Thinner: Deionized water

Metal ions in tap water may lead to early corrosion failure.

If thinning is required, water may be added up to a maximum of 25 % for air spray and 5 % for airless spray. This shall be done after mixing of the two components.

Thinning:

Care must be taken to the amount of water used for thinning. More thinning means slower drying. If the amount of water added exceeds the recommended limit paint defects such as flash rusting / blistering / cracking and bad curing may happen, especially when application is done at high humidity with poor air movement.

Thinning may be required to adjust the spray pattern and for rolling and brushing. Thinning will lower the viscosity, which can reduce sag resistance, prolong pot life and increase drying time. Thinning must be done with care as this will result in lower maximum thickness. Thick wet films will require much longer drying times than specified in TDS.

Add thinner in properly mixed paint before the end of pot life.

Measure the thinner volume accurately with a measuring container. Do not add thinner by eye measurement.

Always have sufficient tools available in order to be able to dismantle and clean out the application equipment should blockages or an unscheduled stop to the work occur.

When using single feed airless spray and conventional air spray equipment ensure the pump, pressure pot, lines and gun are fully flushed with thinner after spraying stops for a prolonged period.

All equipment containing solvents in the pump, hoses and gun have to be thoroughly cleaned according to the following instructions.

Before spraying:

Circulate Jotun Thinner No. 17 through the equipment and hoses. Then Jotun Thinner No. 4 before fresh clean water. Circulate water in equipment and hoses long enough to remove Thinner.

After spraying:

Circulate clean fresh water in the equipment and hoses long enough to get the clean water from the outlet. Then circulate Jotun Thinner No. 4 and finally Jotun Thinner No. 17.

If the application equipment is made in stainless steel, designed for and only used for application of water borne coatings this preparation and cleaning procedure is not needed. Thoroughly wash equipment with water between waterborne coatings. Make sure that no paint is left in the pump, hoses or gut.

## Application data

### Spray application

#### Airless Spray Equipment

|                                |                  |
|--------------------------------|------------------|
| Pump ratio (minimum) :         | 32:1             |
| Pressure at nozzle (minimum) : | 150 bar/2100 psi |
| Nozzle tip (inch/1000) :       | 13-17            |
| Filters (mesh) :               | 70-100           |

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

### Maintaining of equipment:

- Water based coatings are corrosive to steely equipment, therefore equipment made of carbon steel is generally not recommended.
- Equipment made of carbon steel (if however is used) should be cleaned thoroughly with water and then filled with Jotun Thinner No. 4 or other approved mildew preventive, if the next application is after more than 4 hours. This is to prevent rusting or mildew growth. Flushing with water is needed before next use of the equipment.
- Other non-steel equipment should also be filled with Jotun Thinner No. 4 or approved mildew preventive for daily maintenance. Flushing with water is needed before next use of the equipment.

### Air Spray Equipment

|                                |                |
|--------------------------------|----------------|
| Pressure at nozzle (minimum) : | 2.1 bar/30 psi |
| Nozzle tip:                    | 1.1-1.5        |

### Other application tools

#### Brush application

Suitable for application by brush, especially recommended for first coat or stripe coating application in corners, on edges and other areas difficult to reach. It will be necessary to apply additional coats to achieve a similar dry film thickness as when the coating is applied by airless or air spray. Brushes of natural materials are not recommended.

#### Roller application

Can be applied by roller. The addition of a small volume of thinner is recommended to achieve better flow. As with brush, it will be necessary to apply additional coats to achieve a similar dry film thickness when the coating is applied by airless or air spray. Roller is not recommended for application direct to prepared metal, and for stripe coating. Emulsion roller is recommended.

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## Film thickness per coat

### Typical recommended specification range

#### Airless spray:

|                            |          |                   |
|----------------------------|----------|-------------------|
| Dry film thickness         | 40 - 60  | µm                |
| Wet film thickness         | 75 - 115 | µm                |
| Theoretical spreading rate | 13 - 8.7 | m <sup>2</sup> /l |

#### Air spray:

|                            |             |                   |
|----------------------------|-------------|-------------------|
| Dry film thickness         | 30 - 50     | µm                |
| Wet film thickness         | 60 - 95     | µm                |
| Theoretical spreading rate | 17.3 - 10.4 | m <sup>2</sup> /l |

Too high film thickness will increase the risk of foaming, which will cause pinholes and gloss reduction. The dry film thickness must be strictly controlled and not exceed 90 µm.

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## 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.

### Ventilation

Sufficient ventilation is very important to ensure proper drying/curing of the film.

Care must be taken to the amount of water used for thinning. More thinning means slower drying. If the amount of water added exceeds the recommended limit, paint defects such as flash rusting / blistering / cracking and bad curing may happen, especially when application is done at high humidity with poor air movement.

### 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    35 °C

|                           |      |        |        |
|---------------------------|------|--------|--------|
| Surface (touch) dry       | 2 h  | 75 min | 30 min |
| Walk-on-dry               | 18 h | 9 h    | 3 h    |
| Dry to over coat, minimum | 18 h | 9 h    | 3 h    |

Drying and curing times are determined under controlled temperatures and relative humidity below 70 %, and at average of the DFT range for the product.

After flash-off the product can be force dried at max. 60 °C.

Walk-on-dry: 1 h

Minimum flash-off time at substrate temperatures.

10 °C: 1 h

23 °C: 45 min

35 °C: 30 min

Minimum flash-off time is the shortest time required for enough water to evaporate, before force drying.

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.

## 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 | 35 °C |
|--|-------|-------|-------|
| Itself                                   | 10 d  | 7 d   | 3 d   |

## Other conditions that can affect drying / curing / over coating

### Water/Moisture contamination

If the wet coating is exposed to relative humidity above 85% or to moisture before the coating is at least Walk-on-dry, then blushing may occur. Blushing will cause fading of bright colours, and will affect the gloss. Provided the coating is fully dried/cured the protective properties will not be affected.

All affected areas should be lightly sanded, cleaned and recoated.

### Early water resistance

In general, paint film will have certain water resistance after 48 hours drying at 23 °C or above and with a humidity range between 40-70 %. After 7 days the paint film will achieve the optimal water resistance property. Longer drying time will be needed with lower ambient temperature.

### 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.

### Surface finish

Application of polyurethane topcoats in hot weather or on hot substrates can result in loss of gloss. Affected areas should be lightly sanded and the coating reapplied. Slower evaporating thinners could assist in solving the problem. To be discussed with your Jotun technical representative.

### Coating film continuity

When required by the specification, the coating shall be tested for film discontinuity according to ASTM D 5162, test method A or B as appropriate for the actual dry film thickness. All recorded defects shall be repaired by best practical means.

### Finish

The application process of a top-coat product significantly influences its final finish and gloss. Techniques like brushing, rolling, and spraying each have unique impacts, with spraying generally providing the smoothest and most uniform finish. Environmental factors such as temperature, humidity, and air flow also will also effect the appearance of the coating. Additionally, the quality and maintenance of tools, including brushes, rollers, and spray guns, is important. Properly calibrated and clean tools ensure a smooth application, free of imperfections.

## 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

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

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

### Reference to related documents

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

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

## Symbols and abbreviations

min = minutes

h = hours

d = days

°C = degree Celsius

° = unit of angle

µm = microns = micrometres

g/l = grams per litre

g/kg = grams per kilogram

m<sup>2</sup>/l = square metres per litre

mg/m<sup>2</sup> = milligrams per square metre

psi = unit of pressure, pounds/inch<sup>2</sup>

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.