



**NIPPON PAINT MARINE**



**“AQUATERRAS”**  
**Application Manual**  
**(Full Blasting)**

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Rev. 3

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An innovative biocide-free antifouling paint based on new technology. Reduction of frictional resistance and prevention ship-fouling organism from settling is realized by its hydrophilic & hydrophobic micro-domain structures and its hydrolysis reaction.

Regarding application of AQUATERRAS, AQUATERRAS system can be applied without any special equipment and materials. Paint application is necessary in accordance with the following procedures.

## 1. Standard scheme

### 1) Flat bottom & Vertical bottom

" AQUATERRAS A/C+ AQUATERRAS " system

Process	Product name	DFT( $\mu\text{m}$ )	Coating Type
A/C	AQUATERRAS A/C (Red oxide)	125	Epoxy A/C
	AQUATERRAS A/C (Gray)	125	Epoxy A/C
A/F	AQUATERRAS	*	Biocide-free SPC A/F
	AQUATERRAS	*	Biocide-free SPC A/F

\* DFT of AQUATERRAS depends on operating state and service life.

### 2) Colour scheme of AQUATERRAS system

For multiple coats, AQUATERRAS colour scheme is shown in following table.

Coating times	1st	2nd	3rd	4th
1 coat system	B			
2 coat system	LB	B		
3 coat system	B	LB	B	
4 coat system	LB	B	LB	B

\* B : Brown, LB : Light brown

\* Brown colour to be top coat.

## 2. High pressure fresh water washing

At dry docking, any salt, slime layer, marine growth and foreign matters should be removed by HPFWW. Wash down all underwater areas before they become dried up and stiff. Any delay in this process allows foreign matters and skeleton layers dryer and therefore harder to remove. Prepare facilities for HPFWW in advance in order to start this immediately after dry-up.

### 1) Procedure

- HPFWW should be carried out as early as possible immediately after dry-up.
- Considering falling down of salt, slime, marine growth with washing water from upper of hull, HPFWW should be done from upper part of topsides down to boot top, vertical and flat bottom.

### 2) Pressure of HPFWW

- Vertical hull (topsidess to vertical bottom) : 200kg/cm<sup>2</sup> and above
- Flat bottom : 200 kg/cm<sup>2</sup> and above
- Especially, washing down with fan-jet and / or rotary-jet is recommended for flat bottom.



### 3) Checkpoints of HPFWW

As any residues of slime layer and salt etc. will badly affect the adhesion between coating layers, thorough washing down is necessary in accordance with the following procedures.

- Slime etc. should be thoroughly removed by carrying out HPFWW to the entire hull surface.
- Check that the surface exhibits no sliminess (slime residue) by rubbing the wet coating surface with your hand/fingers.
- Any remaining salt concentration is to be less than 30mg/m<sup>2</sup>.
- Washing down should be carried out from both right & left sides of welds so as not to leave any slime residue on or around the welding seams.
- Salt layer and slime residues will be left in way of supporting blocks. Careful & thorough washing down should be carried out to these areas.



### 3. Surface preparation

Before surface preparation, wooden plugs should be inserted into scuppers to avoid water flow from the scupper or upper decks to topsides. And ballast water shall be ejected.

#### A-1) Surface preparation

Rust scale and existing coating should be removed by blast cleaning. Blast cleaned to Sa2 – ISO Standard 8501-1 (2007) is recommended.

#### A-2) Treatment after blasting

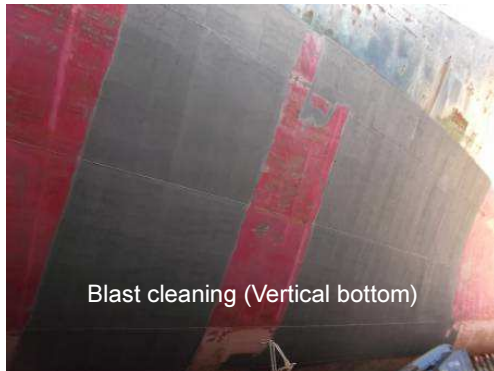
After blast cleaning, dust or abrasives should be removed by air blowing.

## B-1) Surface Preparation (Water Jet / Ultra-High Pressure / UHP)

Surface preparation grade : Wa 2 1/2 (ISO8501-4:2006)

Flash rust grade : up to FR 2 Medium flash rust (ISO8501-4:2006)

\* When the flash rust grade exceeds FR 2, the surface should be re-treated or treated by power tool cleaning.



Blast cleaning (Vertical bottom)



Blast cleaning (Flat bottom)

### 4. Cautions before painting

#### 1) Relative humidity & Dew point

Relative humidity to be below 85% and dew point to be at least 3 °C above steel substrate.

#### 2) Substrate surface to be coated

Paint dust adhered on surface should be removed by power tool cleaning before painting.

### 5. Cautions during painting

#### 1) Over coating intervals

In accordance with standard scheme, paint application shall be started from A/C coating with designated over coating intervals. Please apply standard DFT of A/C coating for anti-corrosive property.

Undercoating	Over coating	0°C		5°C		10°C		20°C		30°C	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
AQUATERRAS A/C	AQUATERRAS A/C	NA	NA	32H	30D	20H	30D	16H	30D	12H	14D
AQUATERRAS A/C LT	AQUATERRAS A/C LT	32H	30D	20H	30D	16H	30D	12H	30D	NA	NA
AQUATERRAS A/C	AQUATERRAS	NA	NA	32H	5D	24H	4D	16H	2D	12H	2D
AQUATERRAS A/C LT	AQUATERRAS	32H	4D	20H	3D	16H	2D	NA	NA	NA	NA

\*\* Over coating intervals depend on DFT etc. For more detail, consult with NPMC representatives

#### 1) DFT control

Especially, it is important for AQUATERRAS system to be achieved with uniform specified. Area volume control is recommended for AQUATERRAS application

#### 2) Application of holding primer

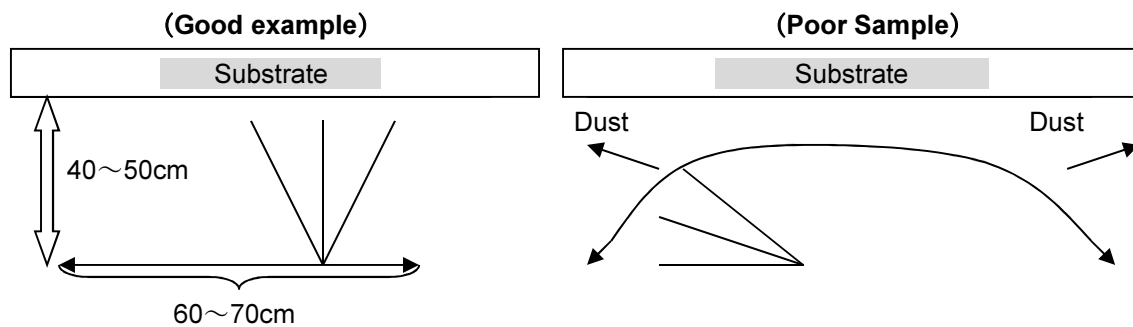
Holding primer may be recommended, when 1st A/C can not be applied by work process reasons.

※Please consult with NPMC representative.

### 3) Application of AQUATERRAS A/C & AQUATERRAS

Following issues are key points for AQUATERRAS A/C & AQUATERRAS application to ensure smooth and uniform coating surface.

- ① Carefully clean the painting equipment before painting
- ② Smaller tip range should be selected than general hull application. Recommendable tip range shall be shown in column 5-5) ①. Select proper tip nozzle which may cause dry spray or uneven paint film surface
- ③ In case that significant dry spray or orange peel etc. occurs during painting process, surface to be coated shall be smoothed with power tool so that average surface roughness can be below 90 $\mu$ m.
- ④ Paint application shall be done with ideal spray pattern, checking proper output pressure of airless spray machine. Spraying in extreme high pressure causes orange peel, sagging, dry spray or uneven paint film. Such application shall be avoided.
- ⑤ Spray the paint by moving the gun slowly, keeping 40 ~ 50 cm distance between gun and substrate and 60 ~ 70cm wide spray shift at right angle. Uniform paint film shall be secured with prevention from dry spray and paint loss. (Refer to following figure)



- ◇ Excessive wide spraying or spraying where spray gun is too far from substrate may cause dry spray.
  - ◇ Do not snake-spray. Stop spraying in a stroke and start next stroke.
  - ◇ When using pole gun, its length should be 1meter to prevent dry spray.
- ⑥ Do not paint under strong wind to prevent dry spray and paint loss
  - ⑦ To prevent dry spray, spray the paint from windward to leeward
  - ⑧ Prepare the sufficient lighting facilities for flat bottom. When painting for flat bottom spray the paint by moving the gun vertically to the substrate surface of flat bottom. Swinging the spray gun may cause the thin film thickness due to lack of overlapping of spray patterns. Spray where gun is too short from the surface may create uneven paint film and cause orange peeling. Therefore, spray the paint keeping 40 ~ 50 cm distance between the gun and surface with proper output pressure.



4) Airless spray machine conditions

① Airless tip

Following table shows the standard airless tip & thinners for distribution of each product.

Airless tip should be selected by checking the atomization conditions. And dedicated thinner should be used for dilution

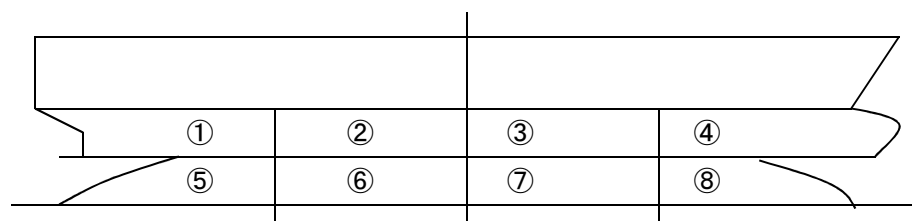
Items Products	Standard tip range	Thinner
AQUATERRAS A/C	0.53~0.74mm (Fan angle : 45°~54°)	NIPPON MARINE THINNER 600 (*)
AQUATERRAS	0.64~0.74mm (Fan angle : 45°~54°)	NIPPON MARINE THINNER 350 (*)

\* THINNER for exclusive use are recommended at hot temperature

- ◇ Airless spray equipment : above 45 : 1
- ◇ Output pressure : above 5kg / cm<sup>2</sup>
- ◇ Refer to product datasheets for other requirements

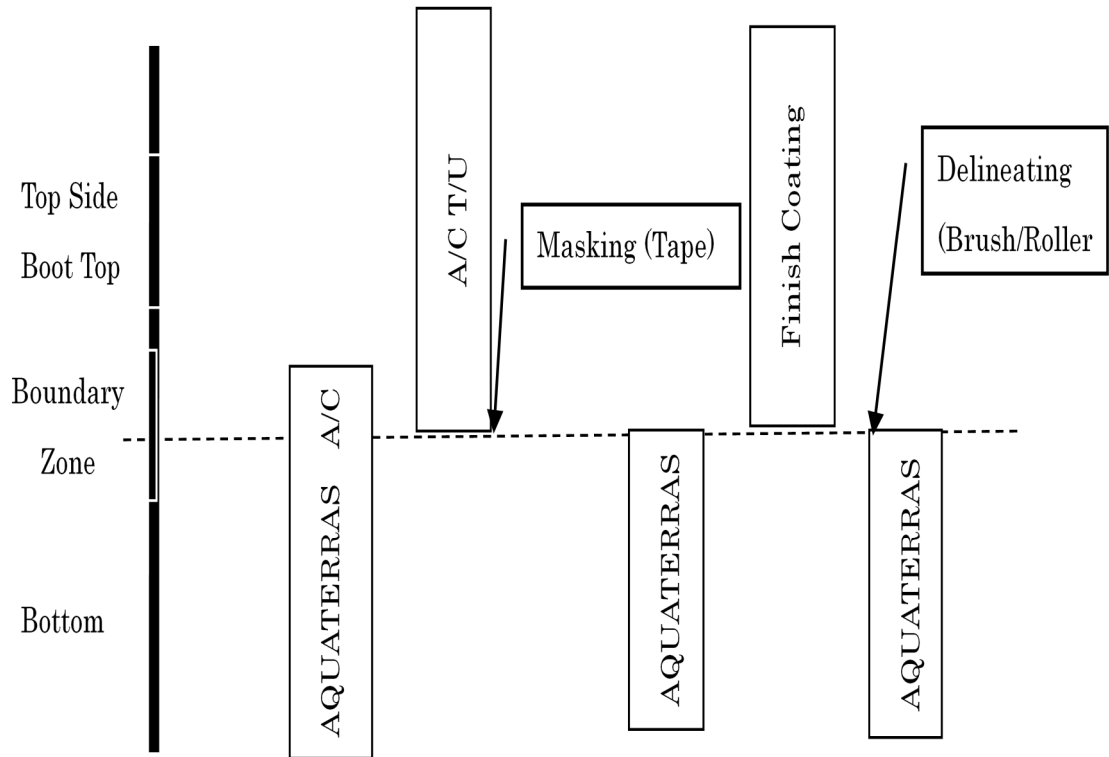
6) Allotment & distribution of paint

AQUATERRAS should be painted uniformly. The amount of paint volume should be allocated / distributed as illustrated below (for reference), and allocated paint volume to each area should be used up completely before moving on.



6. Application for boundary zone

AQUATERRAS A/C + AQUATERRAS system





7. Over coating interval and Drying time before flooding

Ship Speed (Knots)	Number of coat	DFT ( $\mu\text{m}/\text{coat}$ )		Drying time (H:hour,)				
				0°C	5°C	10°C	20°C	30°C
15 or less	2	75~100	Overcoat	24H	6H	5H	4H	3H
			immersion	24H	18H	16H	12H	12H
		105~150	Overcoat	24H	24H	5H	4H	3H
			immersion	48H	36H	36H	12H	12H
16 ~17	2	75~100	Overcoat	24H	6H	5H	4H	3H
			immersion	24H	18H	16H	12H	12H
		105~150	Overcoat	24H	24H	5H	4H	3H
			immersion	48H	36H	36H	24H	12H
18~20	2	75~100	Overcoat	24H	6H	5H	4H	3H
			immersion	24H	18H	16H	12H	12H
		105~150	Overcoat	24H	24H	24H	4H	3H
			immersion	48H	36H	18H	12H	12H
21 and over	2	75~100	Overcoat	24H	24H	24H	4H	3H
			immersion	36H	24H	18H	12H	12H
		105~150	Overcoat	24H	24H	24H	24H	3H
			immersion	72H	36H	24H	18H	12H
15 or less	3	75~100	Overcoat	24H	24H	24H	24H	24H
			immersion	40H	24H	18H	12H	10H
		105~150	Overcoat	24H	24H	24H	24H	24H
			immersion	84H	72H	60H	36H	18H
16~17	3	75~100	Overcoat	24H	24H	24H	24H	24H
			immersion	40H	24H	18H	12H	10H
		105~150	Overcoat	24H	24H	24H	24H	24H
			immersion	**	84H	60H	36H	18H
18~20	3	75~100	Overcoat	24H	24H	24H	24H	24H
			immersion	48H	36H	24H	12H	10H
		105~150	Overcoat	24H	24H	24H	24H	24H
			immersion	**	84H	60H	48H	18H
21 and over	3	75~100	Overcoat	24H	24H	24H	24H	24H
			immersion	48H	40H	30H	18H	12H
		105~150	Overcoat	24H	24H	24H	24H	24H
			immersion	**	**	72H	48H	24H

<Note >

\* Temperature indicates "average temperature in a day".

\* Specified over coating intervals and drying time before flooding shall be maintained.

\* Consult with us for the drying time of \*\* marked parts.

\* Depending on painting condition, DFT may be actually thicker than that of specification. And then longer time may be required than specified drying time

#### 8. Drying time before ballasting

After paint application, drying time before ballasting is to be shown in below table

Drying time (H : hour)				
0°C	5°C	10°C	20°C	30°C
12H	6H	5H	4H	3H

#### 9. General cautions

Antifouling paint contains organic solvents and may cause a rash if paint comes into contact with skin.

- ◇ For detailed information, refer to the SDS.
- ◇ As a precautionary measure before painting, use a protective cream, protective glove, goggles, organic solvent masks and / or dust proof masks.
- ◇ During application, please be off limits to painting site and do not stand

< Example of safety clothing / PPE for painting >

