NIPPON PAINT MARINE

"A-LF-Sea"

Application Manual

for M&R

(Maintenance & Repair)

April 2015

NIPPON PAINT MARINE

Contents

Introduction

A-LF-Sea is a super low friction / self-polishing type antifouling paint which creates a trapped layer of seawater on the boundary surface of the coating film leading to a reduction in the hull's frictional resistance.

A-LF-Sea system can be applied without any special equipment and materials.

1. High pressure fresh water washing (HPFWW)

Immediately after drydocking, any salt, slime layer, marine growth and other foreign matters should be removed by HPFWW.

1) Timing

Wash down all underwater areas before they become dried up and stiff. Any delay in this process allows foreign matter and skeleton layers dryer and therefore harder to remove.

Prepare facilities for HPFWW in advance in order to start this immediately after dry-up.

2) Procedure

- In principle, and to avoid contamination by used wash water carry out HPFWW from the upper part of the ship's topsides down to boottop, vertical bottom and then flat bottom.

3) Pressure of HPFWW

- Vertical hull (topsides to vertical bottom) : 200kg/c ㎡ and above
- Flat bottom : 200 kg/c ㎡ and above

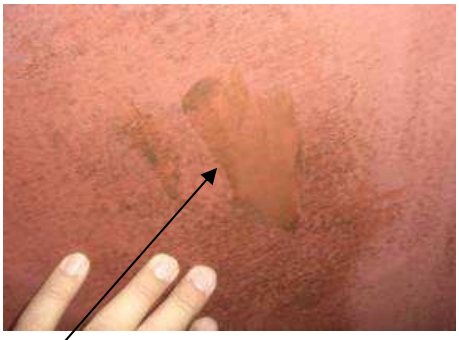
* Especially, washing down with fan-jet and / or rotary-jet is recommended for flat bottom.

4） HPFW Washing Checkpoints

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 slimyness (slime residue) by rubbing the wet coating surface with your hand/fingers.
- Any remaining salt concentration is to be less than 30mg/㎡.
- 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.

Slime layer is remained due to lack of washing down.



Checking by hand if slime layer is Remained.

5） Other requirements

- Any oil and grease should be carefully removed with emulsifying detergent before HPFWW

  Minor spots of oil or grease can be cleaned locally by rubbing with solvent
- Other foreign matters should be removed by proper power tools.

2． Surface preparation

(1) Rusty and / or defective film should be removed by blast cleaning or power tool cleaning.

Spot blasting

Disc sanding

(2) Coating edges surrounding blast cleaned areas should be feathered smooth by power tool.

Removal of loose paint film

Loose paint film around T/U area shall be removed.

* Any loose or flaked coatings should be removed by blasting, power tool cleaning or scraper depending on their scope and distribution.
* For spot blasting to areas where there is heavily scattered corrosion and mechanically damage, the coating edges should be blasted off square and then feathered back to a firm edge.

Loose paint film (Partial blast cleaning)

Rust scale or blistering (Partial blast cleaning)

Square blast cleaning

Square blast cleaning

(4) Water jetting shall be applicable as surface preparation. In this case, the surface should be treated to the following preparation grade and flush rust grade.

Surface preparation grade : Wa 2 1/2 (ISO 8501-4:2006)

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

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

3．Painting

1）Precautions before painting

・Relative humidity, Dew point

Relative humidity is to be below 85% and the dew point is to be at least 3 ℃ above steel substrate.

・Substrate surface to be coated

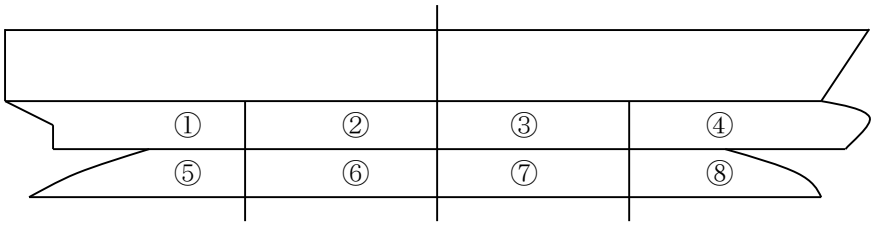
Any paint dust or overspray from the A/C or finish coatings that have adhered to surface to be coated should be removed by power tool cleaning or other suitable method before painting A-LF-Sea.

Removal of paint dust of finish coating adhered on bulbous bow

Removal of paint dust before final coating

2） Allotment & distribution of paint

A-LF-Sea 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.

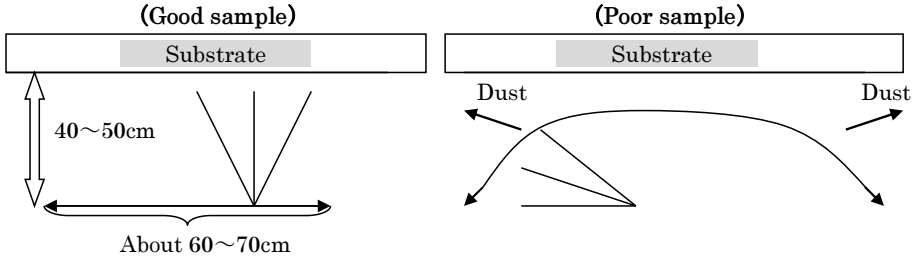


3） Cautions during painting

The following precautions are essential for A-LF-Sea application to ensure as smooth and uniform a coating surface as possible.

- Carefully clean the painting equipment / spray lines before painting.
- Tip range should be 0.64 (Graco 525)~ 0.74 mm (Graco 529) with fan angle 45 ~ 54 ° . Select proper tip nozzle by checking its atomization. Do not select an extremely large size spray tip which may cause dry spray or uneven paint film surface.

- Check the proper output pressure for painting and ideal spray pattern. When painting at excessive high pressure, orange peel, sagging or dry spray may occur and a uniform coating cannot be ensured.
- Spray the paint by moving the gun slowly, keeping a 40 ~ 50 cm distance between the gun and the substrate and keeping about a 1 meter wide spray pass at right angles to the hull.



＊Excessively wide spraying or spraying where the spray gun is too far from the substrate may cause spray dust.

＊When using pole gun, its length should be at the most 1 meter to prevent dry spray.

- Do not paint under strong winds to prevent dry spray and paint loss.
- To prevent dry spray, spray paint from windward to leeward.
- Prepare sufficient lighting facilities for flat bottom.
- When painting the flat bottom, apply the paint by keeping the spray pattern vertically aligned to the bottom.
- Swinging the spray gun excessively may cause the thin film thickness due to lack of overlapping of spray patterns.
- Spray where gun is too close to the surface may create an uneven paint film and orange peeling. Therefore, spray the paint keeping 40 ~ 50 cm distance between gun and surface with proper output pressure.

When spraying A/F paint, keep about 1m wide spray shift at right angle.

4） Airless spray machine conditions

(a) Airless tip

Following table shows the standard airless tip & thinners for dilution of each product. Airless tip should be selected by checking the atomization conditions. And dedicated thinner should be used for dilution.

items / Product	Standard tip range	Graco Tip Range	Thinner name
NOA10M Buff	0.48 ~ 0.53 mm (Fan angle : 45°)	519, 521	NIPPON MARINE THINNER 600
NOA10M LT Buff	0.48 ~ 0.53 mm (Fan angle : 45°)	519, 521	NIPPON MARINE THINNER 600
A-LF-Sea 250	0.64 ~ 0.74 mm (Fan angle : 45 ~ 54°)	525, 527, 529 625, 627, 629	NIPPON MARINE THINNER 300
A-LF-Sea 150	0.64 ~ 0.74 mm (Fan angle : 45 ~ 54°)	525, 527, 529 625, 627, 629	NIPPON MARINE THINNER 300

(b) Airless spray equipment : above 45 : 1

(c) Output pressure : above 5kg ／c ㎡ (4.9bar)

(d) Refer to product datasheets for other requirements.

4． Overcoating intervals

Overcoating intervals between various coating shall be shown as follows.

Prior coat	Subsequent coat	－5℃		5℃		２０℃		３０℃	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
NOA10M	A-LF-Sea	--	--	5H	4D	3H	3D	2H	3D
NOA10MLT	A-LF-Sea	24H	5D	5H	5D	3H	4D	--	--
NOA20M	NOA A/C II (E)	36H	14D	24H	14D	12H	14D	10H	14D
NOA A/C II (E)	A-LF-Sea	30H	5D	20H	4D	12H	3D	8H	2D
A-LF-Sea	A-LF-Sea	**	--	**	--	**	--	**	--

< Note >

・The above overcoating intervals depends on DFT etc. For more detail, consult with us.

5． Drying time before flooding & ballasting

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

Ship's speed	Number of coat	DFT (μm／coat)		Drying time (H：Hour)				
				0℃	5℃	10℃	20℃	30℃
15 knots or less	2	75~100	Flooding	24H	18H	16H	12H	12H
			Ballasting	24H	6H	5H	4H	3H
		105~150	Flooding	48H	36H	36H	12H	12H
			Ballasting	24H	24H	5H	4H	3H
16~17 knots	2	75~100	Flooding	24H	18H	16H	12H	12H
			Ballasting	24H	6H	5H	4H	3H
		105~150	Flooding	60H	26H	36H	24H	12H
			Ballasting	24H	24H	5H	5H	3H
18~20 knots	2	75~100	Flooding	24H	18H	16H	12H	12H
			Ballasting	24H	6H	5H	4H	3H
		105~150	Flooding	60H	36H	24H	24H	12H
			Ballasting	24H	24H	24H	4H	3H
21 knots or more	2	75~100	Flooding	36H	24H	18H	12H	12H
			Ballasting	24H	24H	24H	4H	3H
		105~150	Flooding	72H	36H	24H	18H	12H
			Ballasting	24H	24H	24H	24H	3H
15 knots or less	3	75~100	Flooding	40H	24H	18H	12H	10H
			Ballasting	24H	24H	24H	24H	24H
		105~150	Flooding	84H	71H	60H	36H	18H
			Ballasting	24H	24H	24H	24H	24H
16~17 knots	3	75~100	Flooding	40H	24H	18H	12H	10H
			Ballasting	24H	24H	24H	24H	24H
		105~150	Flooding	**	84H	60H	36H	18H
			Ballasting	24H	24H	24H	24H	24H
18~20 knots	3	75~100	Flooding	48H	36H	24H	12H	10H
			Ballasting	24H	24H	24H	24H	24H
		105~150	Flooding	**	84H	60H	48H	18H
			Ballasting	24H	24H	24H	24H	24H
21 knots or more	3	75~100	Flooding	48H	40H	30H	18H	12H
			Ballasting	24H	24H	24H	24H	24H
		105~150	Flooding	**	**	72H	48H	24H
			Ballasting	24H	24H	24H	24H	24H

(To be continued to next page)

Ship's speed	Number of coat	DFT (μm／coat)		Drying time (H: Hour)				
				0℃	5℃	10℃	20℃	30℃
15 knots or less	4	75~100	Flooding	48H	24H	18H	12H	10H
			Ballasting	24H	24H	24H	24H	24H
		105~150	Flooding	**	**	84H	60H	24H
			Ballasting	24H	24H	24H	24H	24H
16~17 knots	4	75~100	Flooding	48H	24H	18H	21H	10H
			Ballasting	24H	24H	24H	24H	24H
		105~150	Flooding	**	**	84H	60H	24H
			Ballasting	24H	24H	24H	24H	24H
18~20 knots	4	75~100	Flooding	48H	36H	24H	12H	10H
			Ballasting	24H	24H	24H	24H	24H
		105~150	Flooding	**	**	84H	60H	24H
			Ballasting	24H	24H	24H	24H	24H
21 knots or more	4	75~100	Flooding	60H	48H	24H	18H	12H
			Ballasting	24H	24H	34H	24H	24H
		105~150	Flooding	**	**	**	60H	36H
			Ballasting	24H	24H	24H	24H	24H

＊ Temperature indicates “average temperature in a day”.

＊ Specified overcoating intervals and drying time before flooding shall be maintained.

＊ A-LF-Sea shall be generally applied in 1 coat per 24 hours. However, 2 coat system per 24 hours is applicable in the condition of yellow-coloured part. In this case, drying time is shown as 2 coats per 24 hours.

＊ 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.

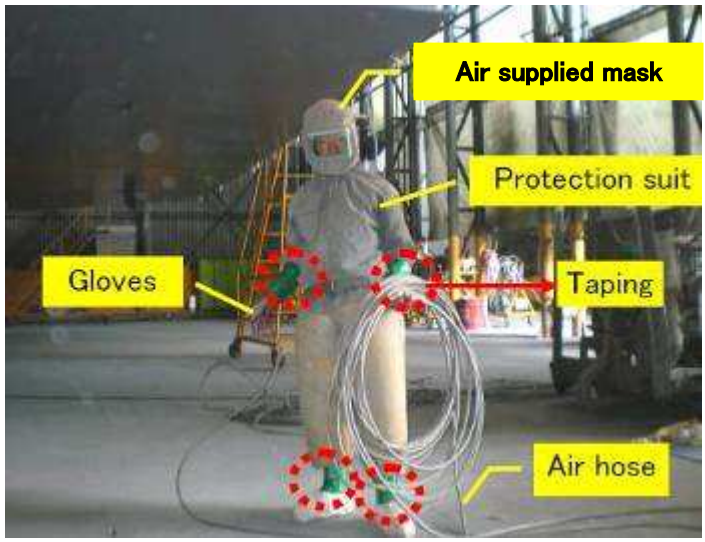
6． General Precautions

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

For detailed information, refer to the MSDS.

As a precautionary measure before painting, use a protective cream, protective glove, goggles, organic solvent masks and / or dust proof masks.

＜Example of safety clothing / PPE for painting＞



Glossary

DFT – Dry Film Thickness

HPFWW – High Pressure Fresh Water Washing

MSDS – Material Safety Data Sheet

NPM – Nippon Paint Marine

PPE – Personal Protective Equipment

Feathering – smoothing of the edge of a previously coated area in order to ensure a smooth surface is achieved when applying a new coating.

D – days

H · hours