NIPPON PAINT MARINE

Basic & New

"A-LF-Sea"

Application Manual

for

Newbuilding

April 2015

Contents

Introduction

A-LF-Sea is a super low friction / self-polishing type antifouling paint which creates water trapped layer on the boundary surface of the coating film in the sea water, leading to reduction of frictional resistance. A-LF-Sea system can be applied without any special equipment and materials.

１．Standard Scheme

１－1. Vertical bottom

NOA10F Rheo + NOA A/C Ⅱ Rheo + A-LF-Sea system

Process	Product Name	DFT (μm)	Type of coating
Block	NOA10F Rheo Buff	175	EpoxyA/C
Pre-launching	NOA A/C II Rheo Gray A-LF-Sea	75 ＊	EpoxyA/C A-LF-Sea
Pre-delivery DD	A-LF-Sea	＊	A-LF-Sea

＊DFT of A-LF-Sea depends on operating state and service life.

＊Painting process depends on each shipyard's construction schedule. Consult with us.

１- ２．Flat bottom

Painting process shall be completed at block stage.

１- ３．Colour scheme

Fro multiple coats, A-LF-Sea's colour scheme is shown in following table.

LF-Sea' coating times	1st	2nd	3rd	4th
A-LF-Sea 250 2 coat system	LB	B		
A-LF-Sea 250 3 coat system	B	LB	B	
A-LF-Sea 250 4 coat system	LB	B	LB	B
A-LF-Sea 150 2 coat system	LB	B		
A-LF-Sea 150 3 coat system	B	LB	B	
A-LF-Sea 150 4 coat system	LB	B	LB	B

B：Brown、LB：Light brown

＊Brown shall be topcoat.

2．Special requirements for appication

2 - 1．Block stage

1) Surface preparation

◇Power tool cleaning to St-3 ISO8501-1) is recommended. However, for welding seams or burnt parts, blast cleaning to Sa 2 1/2 is recommended. Especially, welding parts shall be blast-cleaned as possible in order to avoid detachment problem due to remained alkaline substances.

Surface preparation at block stage

◇White rust on zinc shop primer shall be removed by power tool cleaning.

◇Contaminant such as grease, oil and so on shall be removed thoroughly with solvent wiping.

2) Paint application

◇Overcoating intervals

In accordance with standard scheme, paint application shall be started from A/C coating with designated overcoating intervals. (Refer to 2-3. Overcoating intervals)

For corrosion protection, specified DFT of A/C shall be secured.

After application of NOA10F Rheo

After Application of NOAA/C Ⅱ Rheo

A/F (A-LF-Sea)　N U-MARINE FINISH Orange on topsides

◇DFT control

Especially, it is important for A-LF-Sea system to be achieved uniform specified DFT. Area volume control is recommended for A-LF-Sea application.

◇Others

Holding primer “NIPPON CERAMO T/U” shall be recommended, when 1st A/C can not be applied by work process reasons.

NIPPON CERAMO T./U shall be applied in less than 25 μ m.

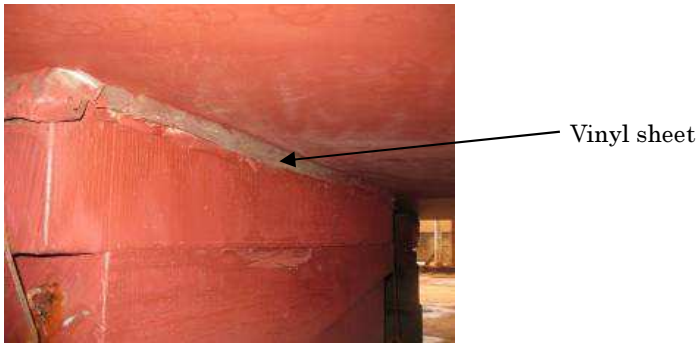
3) Application around supporting blocks

① To avoid pressure damage by supporting blocks, application shall be done in one coat per day.、 After application, drying time shall be kept over 7 days (20℃) and over 10 days (5℃).

＊ The drying time depends on applied DFT or coating time. Consult with us.

② Countermeasures of the damage

Vinyl sheet with solvent resistance shall be used.



2 - 2. Pre-launching stage

1) Timing

◇ Paint application shall be started from the areas where steel works (welding, stress-relieving, grinding etc) have been completed.

◇ After application of A/C and A/F, burnt damage of paint film increases surface roughness and frictional resistance. To reduce repair works due to burnt damage, pre-meeting and pre-notification shall be required with the other working sections.

2) Erection joints

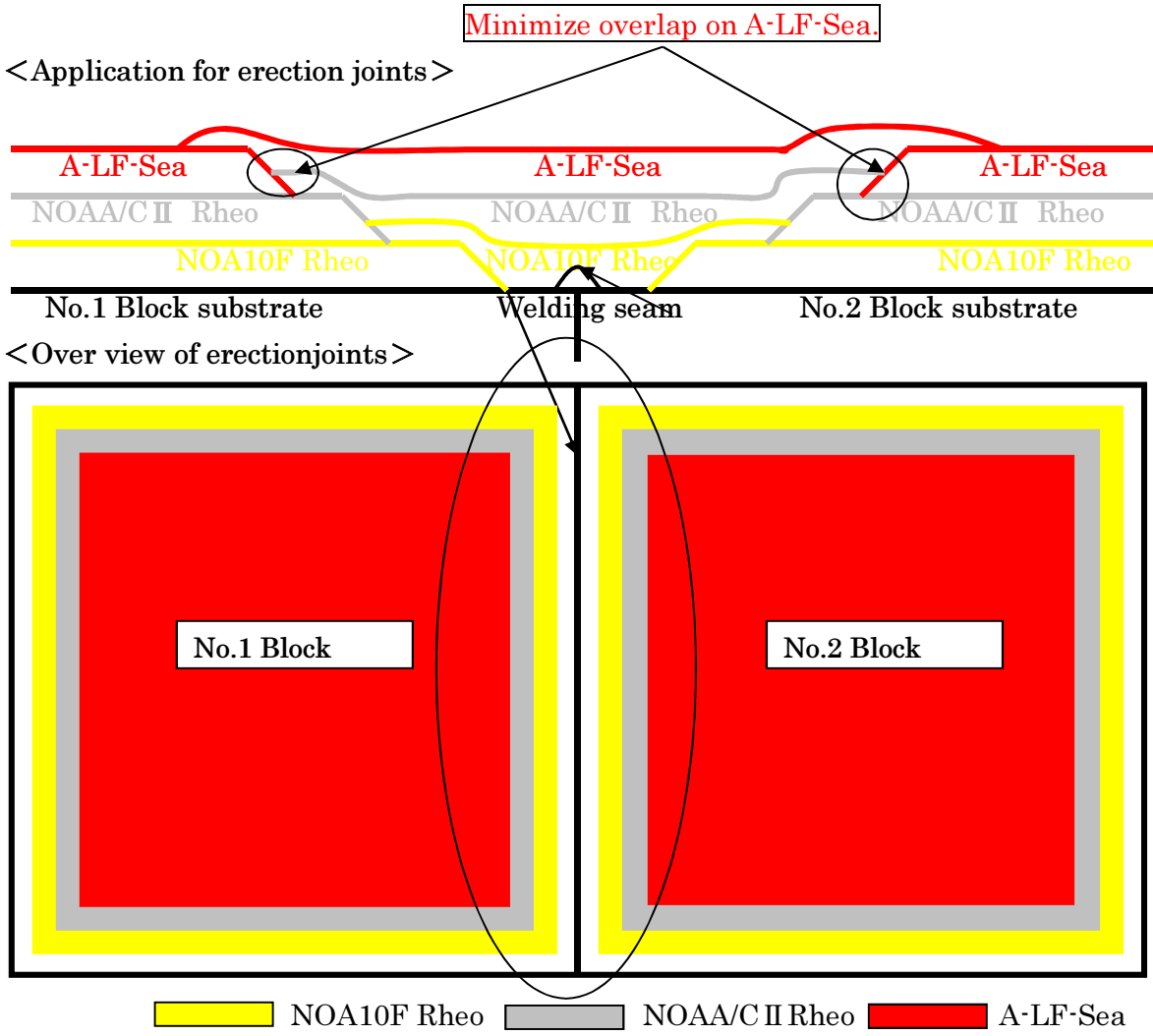
Surface preparation of erection joints is same as that of block. Application immediately after welding causes the defects such as detachment or blistering. Power tool cleaning or blast cleaning shall be required on erection joints.

Surface preparation of erection joints (Power tool cleaning)

Overlap of epoxy A/C coatings on existing A-LF-Sea causes the defects such as cracking or peeling and it increases surface roughness. Therefore overlap of epoxy A/C coatings shall be minimized.

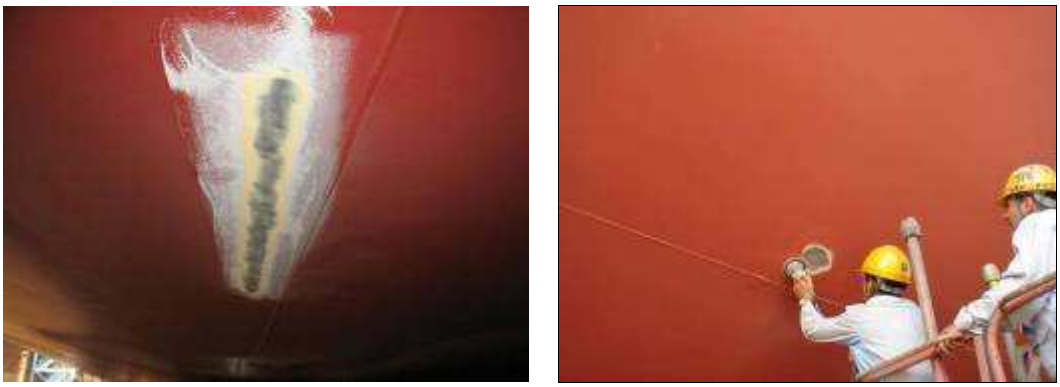
NOA10F Rheo

NOA A/C II Rheo



3) Touching up for damaged parts and burnt areas

◇Erection joints, stress relieved parts, damaged parts burnt areas etc. shall be touched up in accordance with specified coating scheme after surface preparation. And overlap of epoxy A/C coatings shall be minimized.



Surface preparation for burnt part

◇ Burnt areas shall require to remove surrounding loose paint film and shall be power tool cleaned to St-3（ISO8501-1）. And feathering shall be carried out on / around the burnt areas in order to smoothen surrounding.

4) HPFWW after temporary immersion

In case of temporary immersion by tandem building system, the tandem block immersed in sea water shall be washed by the same procedure as pre-delivery drydocking to remove water soluble salt and slimes.

Sifting tandem block

HPFWW after sifting

5) Paint application

① Sequence of paint application

◇ A-LF-Sea shall be painted on vertical bottom after application of topsides and boottop.

◇ Paint dust shall adversary affect A-LF-Sea's antifouling property and polishing property. The dust from surrounding blocks, decks and other exposed areas should be avoided. Paint dust shall be removed with broom or power tool from applied A-LF-Sea.

Dust removal by broom

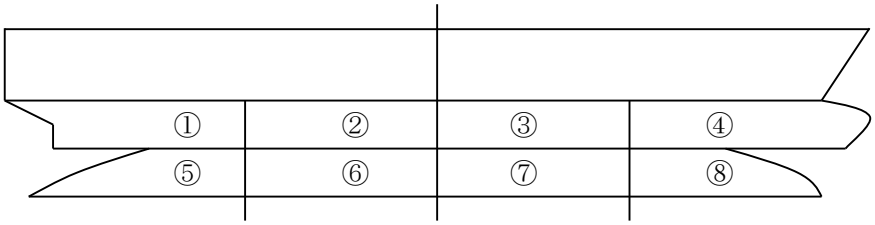
Dust removal by power tool

②DFT control

◇A-LF-Sea should be painted uniformly in specified DFT.

◇Method of DFT control

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. And at block application, paint volume for the area should be used up.



2 - 3. Overcoating intervals, & Airless spray machine conditions

1) Typical overcoating intervals

Prior coat	Subsequent coat	0℃		5℃		10℃		20℃		30℃	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
N CERAMO TU	N CERAMO TU	36H	--	24H	--	20H	--	16H	--	12H	--
N CERAMO TU	NOA10FRheo	36H	--	24H	--	20H	--	16H	--	12H	--
NOA10FRheo	NOA10FRheo	NA	NA	32H	--	24H	--	16H	--	12H	--
NOA10FRheo	NOA A/C Ⅱ Rheo	NA	NA	32H	--	24H	--	16H	--	12H	--
NOA A/C Ⅱ Rheo	NOA A/C Ⅱ Rheo	NA	NA	32H	--	24H	--	16H	--	12H	--
NOA10F LT Rheo	NOA10F LT Rheo	32H	--	20H	--	16H	--	12H	--	NA	NA
NOA10F LTRheo	NOA A/C Ⅱ LT Rheo	32H	--	20H	--	16H	--	12H	--	NA	NA
NOA A/C Ⅱ LT Rheo	NOA A/C Ⅱ LT Rheo	24H	--	16H	--	12H	--	8H	--	NA	NA
NOA A/C Ⅱ Rheo	A-LF-Sea	NA	NA	32H	7D	24H	6D	16H	5D	12H	3D
NOA A/C Ⅱ LT Rheo	A-LF-Sea	24H	6D	16H	5D	12H	4D	8H	3D	NA	NA
A-LF-Sea	A-LF-Sea	24H	--	24H	--	24H	--	24H	--	24H	--

＊Consult with us for overcoating intervals to welding parts (erection joints)

2) Drying time before flooding / immersion

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

Ship's speed	Number of coat	DFT (μm/coat)	Drying time before flooding				
			0℃	5℃	10℃	20℃	30℃
15 knots or less	2	75~100	24H	18H	16H	12H	10H
		105~150	48H	36H	24H	12H	10H
16~17 knots	2	75~100	24H	18H	16H	12H	10H
		105~150	48H	36H	24H	12H	10H
18~20 knots	2	75~100	24H	18H	16H	12H	10H
		105~150	36H	24H	18H	12H	10H
21 knots or more	2	75~100	36H	24H	18H	12H	10H
		105~150	72H	36H	24H	18H	12H
15 knots or less	3	75~100	40H	24H	18H	12H	10H
		105~150	84H	72H	60H	36H	18H
16~17 knots	3	75~100	40H	24H	18H	12H	10H
		105~150	**	84H	60H	36H	18H
18~20 knots	3	75~100	48H	36H	24H	12H	10H
		105~150	**	84H	60H	48H	18H
21 knots or more	3	75~100	48H	40H	30H	18H	12H
		105~150	**	**	72H	48H	24H
15 knots or less	4	75~100	48H	24H	18H	12H	10H
		105~150	**	**	84H	60H	24H
16~17 knots	4	75~100	48H	24H	18H	12H	10H
		105~150	**	**	84H	60H	24H
18~20 knots	4	75~100	48H	36H	24H	12H	10H
		105~150	**	**	84H	60H	24H
21 knots or more	4	75~100	60H	48H	34H	18H	12H
		105~150	**	**	**	60H	36H

＊ 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.

＊ 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.

3) 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	Thinner name
N CERAMO T/U	0.53 ~ 0.74 mm (Fan angle : 45 °)	NIPPON MARINE THINNER 600 (*)
NOA10F Rheo	0.53 ~ 0.74 mm (Fan angle : 45 ~ 54°)	NIPPON MARINE THINNER 600 (*)
NOA10FLT Rheo	0.53 ~ 0.74 mm (Fan angle : 45 ~ 54°)	NIPPON MARINE THINNER 600
NOA A/C Ⅱ Rheo	0.53 ~ 0.74 mm (Fan angle : 45 ~ 54°)	NIPPON MARINE THINNER 600 (*)
NOA A/C Ⅱ LT Rheo	0.53 ~ 0.74 mm (Fan angle : 45 ~ 54°)	NIPPON MARINE THINNER 600
A-LF-Sea 250	0.64 ~ 0.74 mm (Fan angle : 45 ~ 54°)	NIPPON MARINE THINNER 300
A-LF-Sea 150	0.64 ~ 0.74 mm (Fan angle : 45 ~ 54°)	NIPPON MARINE THINNER 300

Note : NIPPON MARINE THINNER 670 is recommended at hot temperature.

(b) Airless spray equipment : above 45 : 1

(c) Output pressure : above 5kg ／c ㎡

(d) Refer to product datasheets for other requirements.

4) Cautions for painting

It is important for A-LF-Sea system to be achieved with uniform specified. Pay attention to the following items.

① Carefully clean the painting equipment / spray lines before painting.

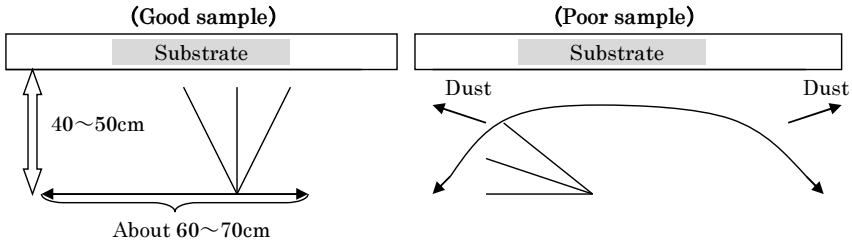
② Tip range should be 0.64 (Graco 525)~ 0.74 mm (Graco 529) with fan angle 45 ~ 54 ° . Select proper tip nozzle by checking its atomization. Do not select an extremely large size spray tip which may cause dry spray or uneven paint film surface.

③ When heavy dust or orange peel may occur on the surface, it is recommended that surface shall be smoothened up to 90 μm by proper power tool cleaning.

③ 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.

When spraying, keep about 60-70c m wide spray shift at right angle

④ Spray the paint by moving the gun slowly, keeping 40 ~ 50 cm distance between gun and substrate surface and about 60 ~ 70 cm wide spray shift at right angle. (Refer to the following figure)



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

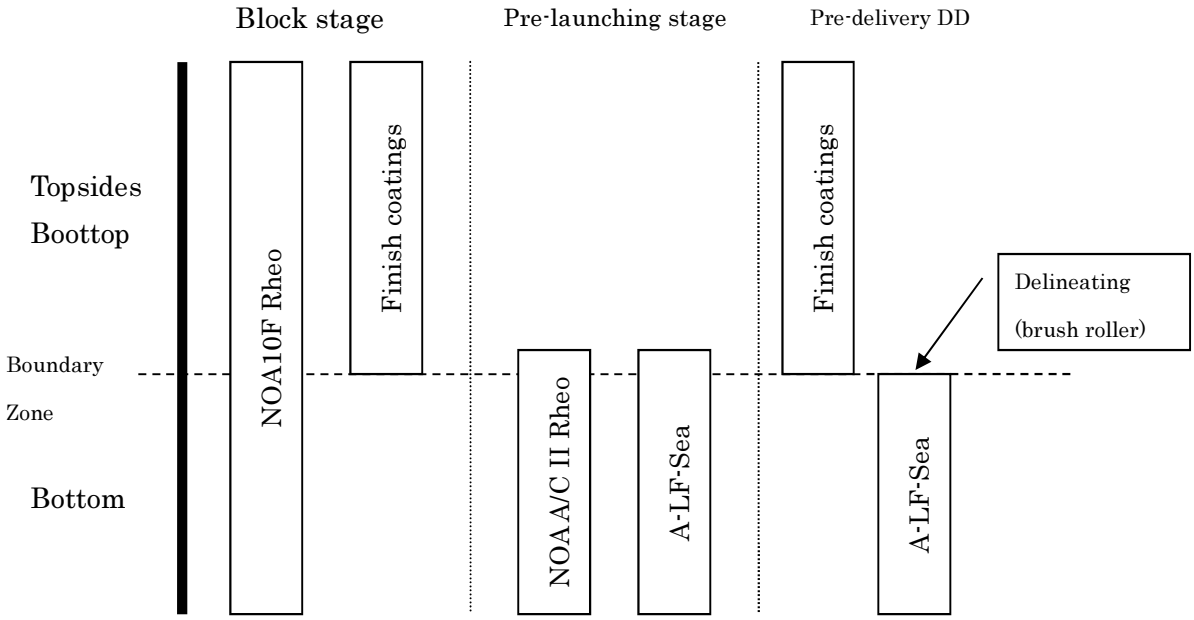
＊Do not snake-spray. Stop spraying in a stroke and start next stroke.

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

- Do not paint under strong wind to prevent dry spray and paint loss.
- To prevent dry spray, spray the paint from windward to leeward.
- 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 gun and surface with proper output pressure.

4) Application of boundary zone

(NOA10F Rheo＋NOA A/C Ⅱ Rheo＋A-LF-Sea)



＊ The above mentioned painting progress at block stage, pre-luanching stage & pre-delivery DD stage depends on each shipyard's practice.

2 - 4. Requirements during outfitting

1) Fender damage

To prevent from fender damages during out fitting, soft and using flexible fender or sprinkling water to hull surface facing to fender shall be recommended.

Flexible fender ／sprinkling water to hull

2) Others

During out fitting, applied A-LF-Sea film may be covered with the dust which flies from other painting site by air.Prior to application, pay attention to wind direction. And dust on allied A-LF-Sea surface shall be removed accordingly with fresh water hosing or brushing.

２－５．Pre-delivery dry docking

1) Drydocking schedule

Prior to drydocking, painting procedure shall be scheduled.

2) Lighting

Proper lighting (luminance, No. of lighting source tsc.) shall be acquired so that surface preparation and painting work can be firmly carried out. Especially, flat bottom area is in dark circumstance even in day time due to supporting blocks which often block off the light. Additional lighting and/or lighting arrangement may be required.

3) Prevention of drain

To avoid drain from upper decks or scuppers, inform the yard's representatives the following requirements and confirm that all are done.

- Insert wooden stopper, cement or putty to all scuppers to blocking out drain.
- Discharge ballast water completely to prevent from condensation.

4) High pressure fresh water washing (HPFWW)

HPFWW shall be carried out according to chapter 2-6 "Procedure of high pressure fresh water washing". It is important that slime should be washed out before slime dries up. HPFWW shall be done immediately before drying up.

5) Removal of dirt

Dirt due to fender or tug boat, shall be removed by power tool cleaning. Oil stain on water line or from scuppers shall be removed by using degreaser or neutral detergent followed by fresh water hosing.

Removal of dirt - Power tool cleaning

6) Surface preparation

① Rusted or damaged areas shall be cleaned by blasting or power tool such as rotary disc sander.

② Loose film around blasted areas shall be removed by power tool and surround film layers shall be feathered.

7) Touching-up of A/C coating

Touching-up of A/C coating shall be mainly required to small damaged areas. Overlapping of A/C coating on top of A-LF-Sea film applied at pre-launching stage shall be minimized by painting with small spray tip as possible. Because overlapping may course cracking or peeling of existing A-LF-Sea film. And specified total DFT of A/C system shall be secured.

8) Application for Boottop & Topsides

Application for boottop & topsides shall be firstly completed at pre-delivery same as that at pre-launching stage.

In case that bottom and boottop & topsides shall be painted at the same time, application of A-LF-Sea shall require to confirm that no dust from boottop or topsides is remained on existing A-LF-Sea surface.

9) Application of A-LF-Sea

① A-LF-Sea shall be applied according to same procedure as that at pre-launching stage

② It is the best method of DFT control that paint volume allocated / distributed to each area should be used up completely before moving on. Refer to column 5)-1 of "2-2 application at pre-launching stage".

2 - 6. Procedure of high pressure fresh water washing

1) Timing

HPFWW shall be started immediately after dried up. Dried slime, sea weed etc. can be hardly removed and severalfold time for HPFWW shall be needed.

HPFWW should be arranged to be started immediately after dried up.

2) Procedures

① HPFWW shall be done immediately after dried up.

② HPFWW shall be started in sequence from topsides, boottop and vertical to flat bottom to prevent water soluble salt and / or slime deposit flown from upper area.

3) Water pressure

Recommended water pressure is shown as follows.

- Vertical part (TS ~ VB) ; Approx. 200kg/ c ㎡～300kg/ c ㎡
- Flat bottom ; Approx. 200kg/ c ㎡～300kg/ c ㎡

4) Degree of HPFWW and checkpoint

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.

5) Check and confirmation of HPFWW

Degree of HPFWW shall be checked and confirmed by shipowner, shipyard and paint supplier before / after HPFWW.

6) Rewashing

Rewashing shall be carried out at the areas where slimes have not been removed completely .

Treatment of water line

2 - 7. General cautions

The paint contains organic solvents and will cause skin rash if attached to skin. For detailed information, refer to the MSDS.

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

＜Example of safety clothes for painting＞