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**Comments - Commentaires**

<b>Title - Sujet</b> Fresh Water Tank Repair	
<b>Solicitation No. - N° de l'invitation</b> MA021-190020/A	<b>Date</b> 2019-12-12
<b>Client Reference No. - N° de référence du client</b> MA021-19-0020	
<b>GETS Reference No. - N° de référence de SEAG</b> PW-\$HAL-219-10848	
<b>File No. - N° de dossier</b> HAL-9-83178 (219)	<b>CCC No./N° CCC - FMS No./N° VME</b>
<b>Solicitation Closes - L'invitation prend fin</b> <b>at - à 02:00 PM</b> <b>on - le 2020-01-06</b>	<b>Time Zone</b> <b>Fuseau horaire</b> Atlantic Standard Time AST
<b>F.O.B. - F.A.B.</b> <b>Plant-Usine:</b> <input type="checkbox"/> <b>Destination:</b> <input checked="" type="checkbox"/> <b>Other-Autre:</b> <input type="checkbox"/>	
<b>Address Enquiries to: - Adresser toutes questions à:</b> Richard, Linda K.	<b>Buyer Id - Id de l'acheteur</b> hal219
<b>Telephone No. - N° de téléphone</b> (902) 402-9059 ( )	<b>FAX No. - N° de FAX</b> (902) 496-5016
<b>Destination - of Goods, Services, and Construction:</b> <b>Destination - des biens, services et construction:</b> MARINE ATLANTIC INC. 65 MEMORIAL DRIVE NORTH SYDNEY NOVA SCOTIA B2A 0B9 Canada	

**Instructions: See Herein**

**Instructions: Voir aux présentes**

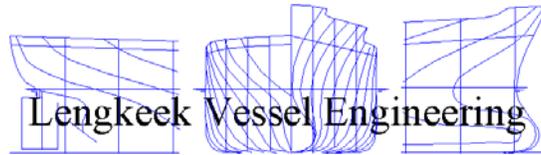
**Vendor/Firm Name and Address**

**Raison sociale et adresse du  
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**Issuing Office - Bureau de distribution**

Atlantic Region Acquisitions/Région de l'Atlantique  
Acquisitions  
1713 Bedford Row  
Halifax, N.S./Halifax, (N.É.)  
Halifax  
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<b>Delivery Required - Livraison exigée</b> See Herein	<b>Delivery Offered - Livraison proposée</b>
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<b>Name and title of person authorized to sign on behalf of Vendor/Firm</b> <b>(type or print)</b> <b>Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)</b>	
<b>Signature</b>	<b>Date</b>



"MV Blue Puttees"

## **Outline Specification for Structural Repair of FW Tank No.16 (Option #1)**

For

**Marine Atlantic**

65 Memorial Drive  
North Sydney, NS



*Prepared By:*

**Lengkeek Vessel Engineering Inc.**

*Report Number: J19041-R03, rev 0*

<i>Prepared By:</i>	<i>B. Howse</i>
<i>Checked By:</i>	<i>T. Newbury</i>
<i>LVE Form 67, rev1</i>	

## Revision Matrix

<i>Rev</i>	<i>Brief description of revisions made</i>	<i>Date of Issue</i>
0	Issued to client	13Nov2019

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## APPENDIX A: FRESH WATER TANK INTERNAL COATING GUIDELINES

## 1 SPECIFICATION DETAILS

### 1.1 SCOPE OF WORK

This outline specification covers work to be completed onboard the Marine Atlantic ferry "M.V. Blue Puttees" to perform structural repairs to reinforce the damaged sections of the watertight perimeter bulkheads for Fresh Water Tank No. 16. The specification outlines the structural work to be completed to prepare the area for the new bulkhead reinforcement.

The Contractor shall make all reasonable arrangements in order to minimize the time the vessel has to be out of service.

### 1.2 GENERAL INSTRUCTIONS

This specification shall be read in conjunction with the latest revision of drawings produced to show the necessary steelwork modifications that shall be undertaken to suit the new installation. The drawings and specification indicate the precise extent of work to be carried out, and the use and location of specific materials.

Wherever the words "approved by", "equivalent" or similar phrases are used in this specification, they shall be understood to mean the material, process, or item referred to.

Approval from the Marine Atlantic is required if the Contractor wishes to deviate from any of the specified methods or recommended materials.

## 2 REFERENCES

- DNV-GL, Rules for Classification of Ships
- CSA W47.1-03, Certification of Companies for Fusion Welding of Steel
- CSA W59-03, Welded Steel Construction (Metal Arc Welding)
- Canada Shipping Act - Hull Construction Regulations
- Canada Shipping Act - Hull Inspection Regulations
- Canada Shipping Act - Safe Working Practices Regulations
- MOSHR, Canada Labour Code - Marine Occupational Safety and Health Regulations
- TP 127E, Transport Canada Marine Safety - Ship Electrical Standards
- IEEE STD 45 - 1998 Recommended Practice for Shipboard Electrical Installations
- Note: In case of conflict between any of the standards, then the most stringent requirements will prevail.

## 3 GENERAL NOTES

### 3.1 ON-SITE PROJECT OFFICER

All work to be completed to the satisfaction of the On-site Project Officer who, unless otherwise advised, will be the Chief Engineer of the ship, or a representative designated by Marine Atlantic to oversee the installation on behalf of the Owner.

Upon completion of each item of the specification, the Chief Engineer shall be notified so that he may inspect the work prior to the complete closing up of any work.

Failure to give notification does not absolve the Contractor of the responsibility of providing the Chief Engineer with the opportunity to inspect any item.

Inspection of any item by the Chief Engineer does not substitute for any required inspection by the delegated Classification Society.

### **3.2 SAFETY**

All contracted work shall be conducted in compliance with the requirements of the Canada Labour Code, Part 2.

Potential Contractors shall include with their bids the name of their Safety Manager or Supervisor who will ensure that these requirements for workplace safety are met

### **3.3 SUB-CONTRACTORS**

All conditions, stipulations etc. listed in the General Notes apply to any Sub-Contractors employed by the Main Contractor to carry out work on any Specification item.

### **3.4 DURATION OF SCHEDULED WORK**

The Contractor shall provide sufficient personnel, material, and equipment resources to complete the specified work, within the period of the contract.

Extra effort required due to the Contractor's failure to maintain his production schedule will not be paid for by Marine Atlantic.

### **3.5 PROTECTION**

The Contractor shall provide adequate temporary protection for any equipment or areas affected by his work.

The Contractor shall take proper precautions to maintain in a proper state of preservation any machinery, equipment, fittings, stores or items of outfit which might become damaged by exposure, movement of materials, paint, sand, grit or shot blasting, airborne particles from sand, grit or shot blasting, welding, grinding, burning, gouging and painting.

Any damage shall be the responsibility of the Contractor.

### **3.6 WELDING (GENERAL)**

The Contractor shall be currently certified by the Canadian Welding Bureau in accordance with Standard W47.1-03 "Certification of Companies for Fusion Welding of Steel Structures," Division 1, 2.1 or 2.2.

All personnel performing welding shall be approved by the Canadian Welding Bureau.

Welding materials to CSA W59-03.

### **3.7 AUXILIARY SERVICES**

Contractor shall include in the quotation the costs of any and all transportation, rigging, staging, slinging, crantage, removals, and installations of parts and equipment such as may be required to carry out the work.

### **3.8 HOT WORK & FIRE WATCHES**

Any item of work involving the use of heat in its execution requires that the Contractor advises the Chief Engineer prior to starting such heating and upon its completion.

The Contractor shall provide sufficient suitable fire extinguishers and a fire watch during any heating and until the work has cooled.

Ship's extinguishers are not to be used except in an emergency.

### **3.9 RELOCATIONS**

Any piping, manholes, parts and/or equipment requiring removal to carry out specified work and/or to gain access shall be refitted upon completion with new jointing, anti-seize compound, clamps and brackets as applicable (Contractor supply).

### **3.10 TEMPORARY LIGHTING & VENTILATION**

Temporary lighting and/or temporary ventilation required by the Contractor to carry out any item of this specification shall be supplied, installed and maintained in safe working condition by the Contractor and removed on completion of the related work.

### **3.11 VESSEL CLEANUP**

The principal work areas, as defined by this specification, shall be cleaned to "as new condition" on completion of the contracted work.

The Contractor shall ensure that all spaces, compartments and areas of the ship outside of the principal areas of work are "as clean as found" when work is completed.

### **3.12 MATERIALS & TOOLS**

All materials, unless otherwise specified, to be supplied by the Contractor.

Contractor to supply all necessary tools to perform specified work.

Ship's tools and equipment will not be available for Contractor's use except for specialty tools that will be issued by and returned to the Chief Engineer in good condition.

### **3.13 SMOKING**

Company Policy forbids smoking on Marine Atlantic vessels except in designated smoking areas.

Contractor shall inform workers of the smoking policy and ensure that it is complied with in all cases.

### **3.14 FACILITIES**

The work period will be carried out at the Marine Atlantic Dock facilities in North Sydney, NS.

If the Contractor does not have access to washroom facilities off the ship, a designated washroom on board will be open during regular working hours for Contractor's use. If the cleanliness of the washroom is adversely affected by this usage, Marine Atlantic reserves the right to stop Contractor use of the facility.

### 3.15 DOCKSIDE CLEANUP

The Contractor is responsible for the complete cleanup of adjacent dock areas used by his personnel and/or equipment during and after completion of the contracted work.

## 4 STRUCTURE & OUTFIT

### 4.1 RELEVANT DOCUMENTS

#### Drawings/Reports

Drawing No: J19041-SK02 Rev.1 MV Blue Puttees Fresh Water Tank No.16 – Details of Proposed External Repairs

#### References

- DNV-GL Rules for Classification of Ships
  - Canada Shipping Act - Hull Construction Regulations
  - Canada Shipping Act - Hull Inspection Regulations
  - Canada Shipping Act - Safe Working Practices Regulations
  - MOSHR Canada Labour Code - Marine Occupational Safety and Health Regulations
  - IACS No. 47 Shipbuilding and Repair Quality Standard (1996)  
Part B – Repair Quality Standard for Existing Ships
- Note: In case of conflict between any of the applicable standards, then the most stringent requirements will prevail.

### 4.2 MATERIAL REQUIREMENTS

All new steel plate and shapes shall be minimum DNV-GL Grade 'AH-36' or equivalent. Mill certificates shall be provided for all materials. Refer to the guidance drawing as listed above for any additional material requirements.

The Contractor shall supply all material required, including any material required to complete the work which is not explicitly identified in this specification. See also applicable structural guidance drawings for material requirements.

All new steel work shall be sandblasted and shop primed with a primer compatible with the vessel's existing paint system, unless noted otherwise. On completion of all welding, all damaged paintwork shall be wire brushed to remove loose material.

All work shall be consistent with good shipbuilding practice where standards are not applicable. The work shall be conducted to the satisfaction of the designated approval authority.

### 4.3 OUTFIT & EQUIPMENT REMOVALS

The existing Fresh Water Tank No.16 is located between Decks 2 and 3 and spans between Frames 17 and 29, 4075 mm off centerline to port and starboard.

Contractor shall provide all ancillary services necessary to complete the subject modifications. These may include, but are not limited to temporary removal of interference items, staging, cleaning, debris removal, shore power, etc.

Contractor shall provide all appropriate permits for entrance into and completion of welding in confined spaces if required.

In areas that are to be disturbed by the proposed work, the Contractor is responsible for identifying the locations and ensuring that all existing materials such as fixtures, insulation, sheathing, cables, pipes, machinery, etc. are removed or pulled back temporarily and the area made clear and safe for the work to proceed.

Longitudinal bulkhead 4075 mm off centerline to port is located inside the Technical Water Tank No.16P and therefore does not require any outfit/equipment removals. For the other three perimeter bulkheads, all equipment, piping and cables shall be disconnected and/or moved from the areas affected by the new reinforcement structure. All bulkhead and deck insulation that is present shall be removed and/or moved away from affected areas. Extent of equipment and outfit removals is to be determined on site.

When the work is completed, the Contractor shall assume responsibility for restoring the area to the condition it was in before the work commenced. Additional care shall be taken to ensure that the areas in question are in no danger of fire risk while any hot work is undertaken.

#### **4.4 STRUCTURAL REINFORCEMENT**

Existing tank bulkheads shall be reinforced by welding new intermediate stiffeners and headers to the outside of the tank boundary bulkheads. All new intermediate stiffeners shall be 200x9 HP and new headers shall be 160x8 HP. The new vertical stiffeners shall be scribed to suit any deformation in the damaged bulkhead plating. All new brackets shall be 8mm (or 5/16") plating. Care shall be taken to ensure proper alignment and positioning of new stiffening to existing plate.

Any existing damaged bulkhead stiffeners and/or brackets or portions thereof, that are deemed by the delegated Class society (DNV-GL), to be unacceptable shall be removed and replaced with new using the same scantlings and overall dimensions.

All new steel structure to be DNV-GL grade AH36 or equivalent. New steelwork shall be free of rust, scale, dirt and grease. New steel to have commercial blast SSPC-SP6 and given two coats of suitable shop primer, finish coatings shall be to owner's specification.

The extent of the bulkhead structural reinforcement is shown on the accompanying guidance drawing, J19041-SK02.

#### **4.5 WELDING**

All butt welding of new plating to existing plating shall be full penetration bevel type welding. All other weld connections shall be double continuous fillet welds, 5mm leg length unless noted otherwise.

In way of plate removals, any slag, dirt, grease, paint etc. shall be removed before areas of new steel are welded to existing steel.

After completion of welding, any spatter shall be removed and the welds ground smooth before painting is undertaken.

Contractor shall have available any required weld procedure data sheets (WPDS) for completing the entire structural repair.

Contractor shall be responsible for weld sequencing as per the referenced IACS No.47, Part B guideline (Sect. 6.2 Renewal of plates) to ensure any new plates do not suffer from distortion during construction.

#### **4.6 NEW PAINT**

The external structure of the fresh water tank shall be given two coats of shop primer and painted to match the existing ship's paint scheme.

The internal structure of the tank shall be grit blasted, washed and coated with heavy duty epoxy tank lining paint Interline 975P. The details of the paint scheme, application guidelines and surface preparation can be found in Appendix A.

## 5 TESTS AND TRIALS

### 5.1 GENERAL

The work shall be carried out to the satisfaction of the Project Officer/Chief Engineer and the delegated Class Society, DNV-GL.

### 5.2 INSPECTIONS

Inspections shall be carried out by the Project Officer/Chief Engineer and the delegated DNV-GL inspector. The representative shall conduct a final inspection to determine acceptance of the work in accordance with the latest DNV-GL rules. The work shall also be inspected by the Contractor to ensure the methods of installation and workmanship conform to the drawings and specification.

A physical inspection of all welding of new structure and any repairs shall be carried out by the Contractor to ensure that all welds are satisfactory and contain no visible defects or deficiencies. In addition to 100% visual inspection, welded joints shall be examined using 100% MPI for butt welds and/or corners and cruciforms and dye penetrant on seams welds, or as otherwise agreed with the DNV-GL inspector.

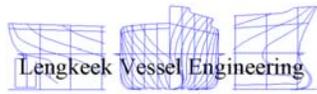
Non-destructive examinations of welds shall be undertaken by professional personnel qualified to do so. All test results, calibrations, measurements, trials and readings shall be properly tabulated, compiled and three typewritten bound copies shall be provided; two copies to the Project Officer with workers original handwritten notes and one copy to the DNV-GL inspector.

The full extent of any weld defect shall be ascertained by applying additional non-destructive examinations where required. Unacceptable defects shall be completely removed and where necessary, re-welded. The repair shall be examined after re-welding.

### 5.3 TESTS AND TRIALS

After all welding inspections are complete and after any repairs are made if applicable, and the welds are proven to be acceptable, the fresh water tank shall be tested to ensure structural integrity and watertightness.

Leak testing shall be carried out on tank boundaries prior to the protective coating being applied to welds and/or burn marks on the internal surfaces. Shop primer may be applied prior to leak test. A hydrostatic test shall be performed with the tank filled to 2.4 m head of water above Deck 3. Contractor shall have the testing procedure approved by the DNV-GL inspector prior to testing. For further details on tank testing, Contractor shall refer to the latest DNV-GL rules.



## **APPENDIX A: FRESH WATER TANK INTERNAL COATING GUIDELINES**

## APPLICATION GUIDELINES

### POTABLE WATER AND LIQUID MUD TANKS

**Interline® 975P**

**Revision 1**

**Issue Date: 4<sup>th</sup> October 2017**

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# Application Guidelines

## Interline® 975P

Revision 1 Date 4<sup>th</sup> October 2017



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## **1. SCOPE AND PURPOSE**

The International Paint Potable Water and Liquid Mud Tank Coatings Application Guidelines have been produced to ensure that a coating system, as applied, provides adequate protection against corrosion such that potable water is not tainted.

Successful in-service performance of a tank coating system depends upon both the correct choice of coating and the adoption of the correct procedures for surface preparation and paint application.

The responsibilities for achieving the specific standards outlined and for carrying out surface preparation and paint application rest with the Contracting Company and Shipyard. Under no circumstances do these responsibilities rest with International Paint. We will generally provide for the presence of a Technical Service Representative at key stages during the performance of the contract. The role of the International Paint Technical Service Representative is advisory only unless otherwise specified in the terms and conditions of the contract.

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## 2. PRODUCT SPECIFICATION AND PRODUCT CURE GRAPHS

### 2.1 SURFACE PREPARATION

#### 2.1.1 Surface Preparation

Grit blast entire tank to ISO Standard 8501-1 (2007) - Sa2½, equivalent to "Near White Blast Cleaning" SSPC-SP10. A surface profile of between 50 and 100 microns (2 and 4 mils) is required.

#### 2.1.2 Application

Airless spray or plural component spray.

### 2.2 SPECIFICATION

	<u>Coat</u>	<u>Product</u>	<u>Colour</u>	<u>Dft (microns)</u>			<u>Dft (mils)</u>		
				<u>Spec</u>	<u>Min</u>	<u>Max</u>	<u>Spec</u>	<u>Min</u>	<u>Max</u>
(i)	Full Stripe	Interline 975P	White	300	(260)	(625)	12	(10)	(24)
		Interline 975P	White						
<b>Or</b>									
(ii)	Full Stripe Full	Interline 975P	White	200	(180)	(300)	8	(7)	(12)
		Interline 975P	White						
		Interline 975P	White						

**Note:** NO THINNING is required nor allowed for application of this product.

**Note:** Interline 975P is only available in white

For potable water service applications it is recommended the shipyard/applicator use new paint hose or dedicated hose, paddles, brushes, etc. to ensure no cross contamination or solvent from previously applied coatings contaminate the Interline 975P. It is also recommended the paint lines be fully purged with product prior to beginning application in potable water tanks.

Applications requiring NSF approval shall conform to NSF requirements at the date of application. [Click here](#) to view the NSF website.

The minimum and maximum dry film thickness (dft) for each system is listed above.

In way of areas of tanks that are difficult to paint due to their configuration, e.g. heavily stiffened tanks, and where a degree of overthickness is unavoidable, consult the International Paint Technical Service Representative for guidance.

# Application Guidelines

## Interline® 975P

Revision 1 Date 4<sup>th</sup> October 2017



### 2.3 NOTES

- 2.3.1 Refer to the accompanying graphs for recommended overcoating intervals, pot life and curing requirements.
- 2.3.2 The drying times quoted refer to a single coat applied to give 300 microns (12 mils) dry film thickness. At higher film thicknesses drying times may be extended, particularly at low temperature.
- 2.3.3 All thicknesses are to be checked by the International Paint Technical Service Representative on site. Any substandard areas are to be rectified.
- 2.3.4 For application the steel temperature must not be lower than 10°C (50°F) and should not exceed 40°C (104°F).
- 2.3.5 For material temperatures below 30°C (86°F) an in-line heater or hot twin feed unit is needed to assist application. Consult International Paint for detailed instructions.
- 2.3.6 At ambient temperatures below 20°C the spray lines may need to be lagged
- 2.3.7 No thinning allowed.
- 2.3.8 Adequate ventilation is required and vent ducting should be arranged to avoid dead spots in the tank. Consult International Paint.

### 2.4 PRODUCT CURE GRAPHS

- 2.4.1 Pot Life
- 2.4.2 Touch Dry Times
- 2.4.3 Hard Dry Times
- 2.4.4 Curing Time
- 2.4.5 Minimum Overcoating Intervals
- 2.4.6 Maximum Overcoating Intervals

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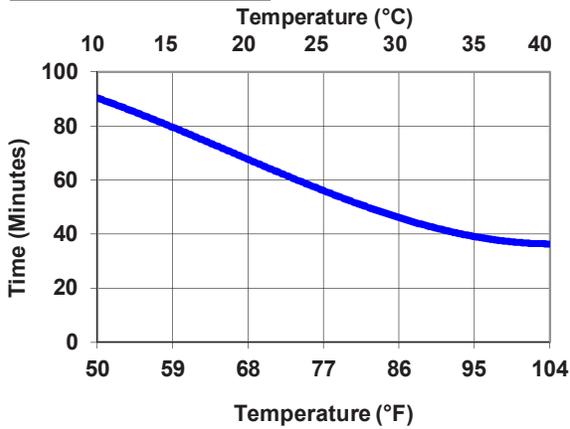
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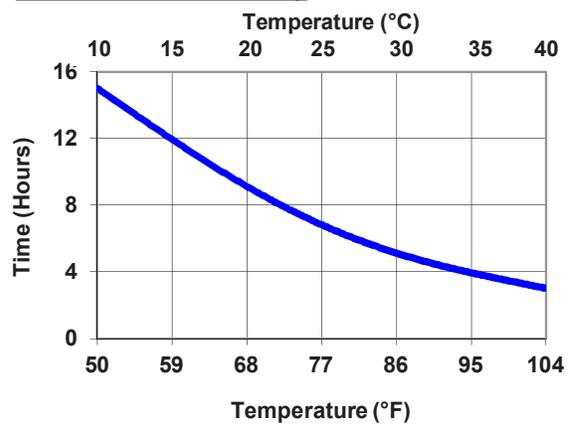
Revision 1 Date 4<sup>th</sup> October 2017



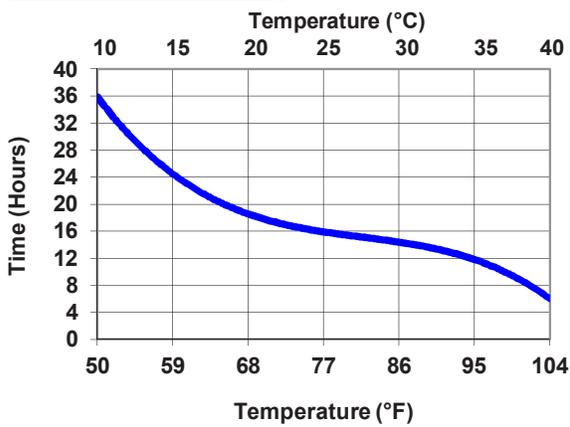
**Interline 975P: Pot Life**



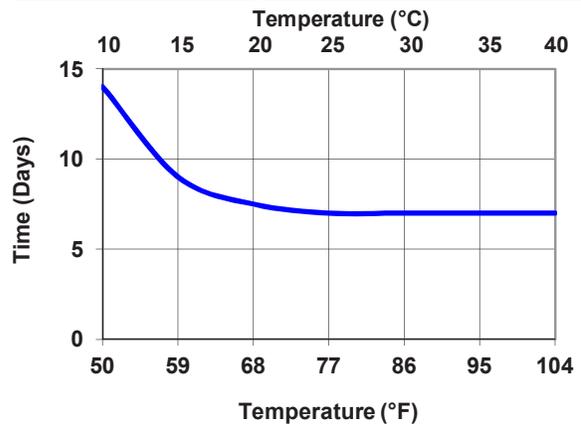
**Interline 975P: Touch Dry**



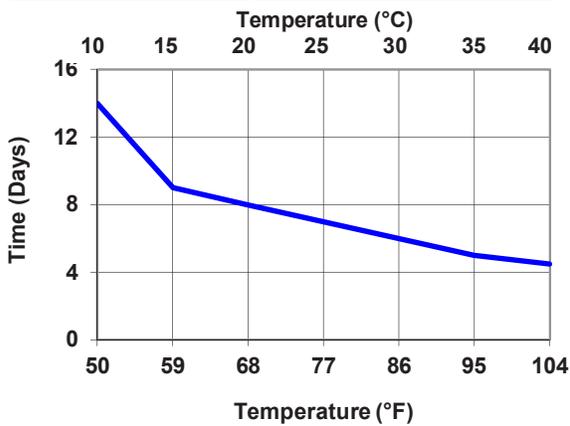
**Interline 975P: Hard Dry**



**Interline 975P: Curing Time (Potable Water Tanks)**



**Interline 975P: Curing Time (Liquid Mud Tanks)**



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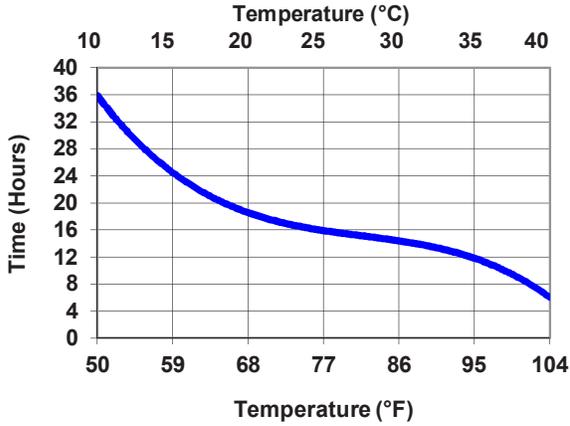
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# Application Guidelines Interline® 975P

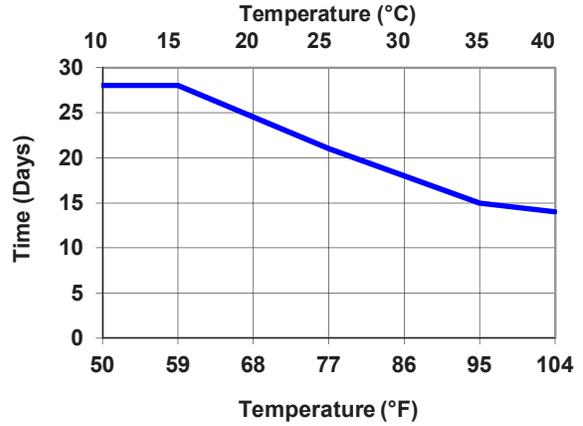
Revision 1 Date 4<sup>th</sup> October 2017



**Interline 975P: Minimum Overcoating**



**Interline 975P: Maximum Overcoating**



## Marine Coatings

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### **3. COATING APPLICATION PROCEDURES**

#### **BLASTING COMPLETE TANK PRIOR TO ANY PAINTING**

- 3.1 Grit blast the entire tank to ISO Standard ISO 8501-1 (2007) - Sa2½ - see Section 2.1.
- 3.2 Upon completion of the blasting, and after inspection by the Contractor Quality Control Department, the International Paint Technical Service Representative will also inspect the whole area and mark up any substandard areas.
- 3.3 All marked areas shall be re-blasted and brought up to the required standard. The whole blasted area is to be vacuum cleaned to remove dust and contamination.
- 3.4 Before coating of the blasted surfaces commences, the amount of residual salt should be measured using the Bresle patch method (ISO 8502-6: 2006 "Extraction of soluble contaminants for analysis – The Bresle method" / ISO 8502-9: 1998 "Field method for the conductimetric determination of water-soluble salts") or similar. These methods are also described in Module No.8 of the International Paint Technical Service training programme. If the result is less than 5 microgrammes/cm<sup>2</sup>, progress to 3.6. If the result is greater than 5 microgrammes/cm<sup>2</sup> progress to 3.5. The number of tests to be carried out is dependent upon tank size and a figure should be agreed before the contract begins. Contact International Paint.
- 3.5 The entire tank is to be fresh water washed. After the tank is dry, the salt contamination level is to be re-measured. The process outlined in 3.4 is to be repeated if the level is more than 5 microgrammes/cm<sup>2</sup>. The entire tank must then be re-blasted to ISO 8501-1 (2007) Sa2½. The specified surface profile given in Section 5.8.4 must be achieved. Salt levels should then be re-measured by following 3.4 above.
- 3.6 All the areas are to receive a full coat of Interline 975P to the specified dry film thickness, with minimum and maximum acceptable thicknesses as given in Section 2.2.
- 3.7 When hard dry, and accepted by the Contractor Quality Control Department, the International Paint Technical Service Representative will check the dry film thickness.
- 3.8 All areas itemised in Section 5.11 are to receive a stripe coat. The stripe coat should be applied within the overcoating intervals specified on the Interline 975P product data sheet.
- 3.9 All areas itemised in Section 5.11 are to receive a second stripe coat. The stripe coat should be applied within the overcoating intervals specified on the Interline 975P product data sheet.
- 3.10 The stripe coats are to be inspected by the International Paint Technical Service Representative.
- 3.11 If required, a second full coat of Interline 975P will be applied to the specified dry film thickness, with minimum and maximum acceptable thicknesses as given in Section 2.2.
- 3.12 When hard dry, and accepted by the Contractor Quality Control Department, the International Paint Technical Service Representative will check the dry film thickness.
- 3.13 Any areas of under thickness are to be brought up to the minimum thickness specified. This must be carried out within the overcoating intervals specified for the product.
- 3.14 All damages are to be either vacublasted or disced to the required standard. All damages are to be touched up with Interline 975P to the specified dry film thickness.

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3.15 It is recommended that finished tanks be subjected to a water test to highlight pinholes/irregularities in the tank coating which have not been identified by normal visual inspection. This may be carried out either by:

- a) full ballasting of the tank for at least 24 hours.
- b) seawater re-circulation using the tank washing system for at least 48 hours. If freshwater is used the test duration must be doubled.

The minimum curing period prior to water testing is shown below:

Temperature °C	Temperature °F	Curing Days
10	50	14
15	59	10
20	68	8
25	77	7
30	86	6
35	95	5

Consult the International Paint Technical Service Representative for guidance.

3.16 Following testing, the tank should be dried and any defective area repaired in accordance with the recommendations of the International Paint Technical Service Representative. These recommendations will be based upon those outlined in Section 6.

3.17 Once all work is complete, fresh water flushing must be carried out. The tank should be filled with fresh water for a minimum of 24 hours, emptied, and then flushed with further fresh water.

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#### **4. TECHNICAL INSPECTION AND PROJECT CONTROL**

Project control by regular inspection and agreement on future action is vital to successful tank coating projects, and in maximising the potential of a coating system.

All parties involved in the tank coating work must agree an inspection procedure prior to work commencing, this should outline how and when both work and inspection will be undertaken.

Prior to commencing the project the contractor(s) must be provided with copies of the relevant product data sheets. Attention should be drawn to pack sizes, mix ratios, thinning restrictions etc.

The International Paint Technical Service Representative must be present during initial mixing of the first drums of product to be applied to ensure that all parties are aware of mixing and application characteristics.

Daily meetings should be arranged to confirm performance of the work and inspection schedules. Minutes of these meetings must be taken and circulated to all participants. Representatives of the contractor, shipyard and ship owner would normally be present at these meetings.

In the event of work continuing at any stage without the approval of International Paint, the Company cannot be held responsible for any subsequent failure of the tank coating system on the areas concerned. Those areas **MUST** be specifically excluded from the performance guarantee. Such an event is termed an **EXCEPTION**. All parties **MUST** be officially informed in writing using the standard Exception Report Form immediately following the occurrence.

International Paint, and any other authorised personnel, may inspect any stage in the process. If additional inspections are considered necessary because of on site conditions or by agreement prior to commencement of the contract, then the contractor must obtain written approval for that stage from International Paint before continuing.

Contractors must supply interpreters if necessary.

On completion of the contract all relevant documentation must be retained, and safely archived, by the Local Technical Service Manager.

Inspection equipment for measurement of profile depth, humidity, wet and dry film thickness, etc should be of approved types and should be within calibration limits.

Note: When measuring the dry film thickness of coatings, the DFT gauge must be calibrated prior to use and measurements made in accordance with ISO 2808:200, unless regulations dictate that an alternative standard should be used.

## **5. GENERAL NOTES**

### **5.1 TANK CONDITION**

#### **5.1.1 Newbuilding**

Prior to commencement of blasting it is essential that the tanks are clean, dry, and in a condition suitable for surface preparation and application of the tank coatings. The following briefly outlines the minimum requirements:

All grease and oil must be removed from all surfaces.

All hot work in way of tanks must be complete.

Cargo suction strums (if fitted) should be removed in order to give total access.

After final tank testing, tanks should be fresh water washed and dried, especially if they have been in contact with sea water.

Defective steelwork, prior to contract commencement, should be repaired in line with the guidance notes given in 5.2 (Steelwork Preparation).

#### **5.1.2 Major Refurbishment**

Prior to the commencement of blasting it is essential that the tanks are clean, dry, and in a condition suitable for surface preparation and application of tank coatings. The following briefly outlines the minimum requirements:

Tanks must be cleaned and gas free.

Any blisters present must be burst and blister caps removed from surface.

Heavy scale must be removed from all surfaces.

Scale, debris and cargo residues must be removed from the tanks.

All grease and oil must be removed from all surfaces.

All hot work in way of tanks must be complete.

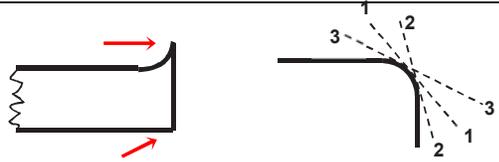
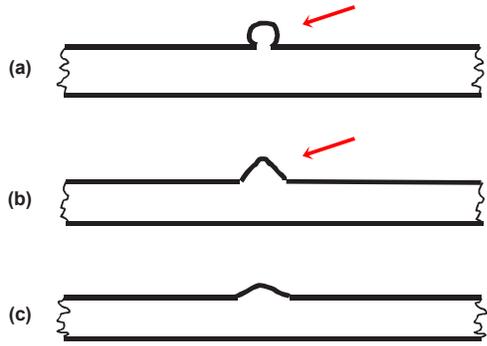
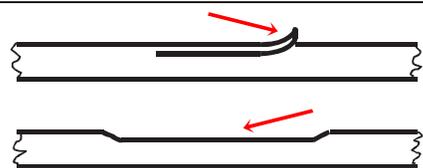
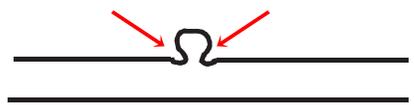
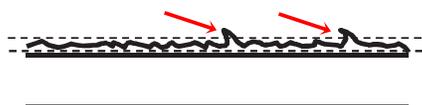
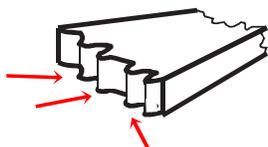
Cargo suction strums (if fitted) should be removed in order to give total access.

All tanks must be fresh water washed.

Any areas of steel renewal should be prepared in the manner described in 5.2 Steelwork Preparation.

**5.2 STEELWORK PREPARATION**

Preparation grades of welds, cut edges and surface imperfections are described in ISO 8501-3. Preparation to P3 grade of this standard will provide surfaces which will ensure optimum paint performance. International Paint recommend the following methods and minimum levels of preparation on any new steelwork:

ITEM	PROBLEM / SOLUTION
Sharp Edge	<p>Remove sharp edges or gas cutting edges with grinder or disc sander.</p> 
Weld Spatter	<p>1. Remove spatter observed before blasting by grinder, chipping hammer etc.</p> <p>2. For spatter observed after blasting:</p> <ol style="list-style-type: none"> <li>Remove with chipping hammer /scraper etc.</li> <li>Where spatter is sharp, use disc sander or grinder until obtuse</li> <li>Obtuse spatter – no treatment required</li> </ol> 
Plate Lamination	<p>Any lamination to be removed by grinder or disc sander</p> 
Undercut	<p>Where undercut is to a depth exceeding 1mm and a width smaller than the depth, repair by welding or grinding may be necessary</p> 
Manual Weld	<p>For welding bead with surface irregularity or with excessive sharp edges, remove by disc sander or grinder</p> 
Gas Cut Surface	<p>For surfaces of excessive irregularity, remove by disc sander or grinder</p> 

### 5.3 VENTILATION

Ventilation is necessary during abrasive blasting operations to ensure adequate visibility. Flexible trunking should be used to allow the point of extraction to be reasonably close to the personnel carrying out the blasting.

During and after coating application the ventilation system and trunking must be so arranged such that “dead spaces” do not exist. As solvent vapours are heavier than air, and will tend to accumulate in the lower areas of tanks, it is important that they are extracted from those areas. This must be balanced with fresh air being introduced into the tank.

Equipment used must not re-introduce abrasive dust, solvent vapour etc. into the tank. For this reason a positive pressure, above normal atmospheric pressure, should be maintained inside the tank. As a “rule of thumb” fresh air supply/extraction should be in the approximate ratio of 4:3.

Ventilation must be maintained during application and continue whilst solvent is released from the paint film during drying. Failure to do this may result in solvent retention within the coating system that will adversely affect its long term performance. It must be maintained for a minimum period of 48 hours after coating application has been completed unless otherwise agreed with International Paint.

The level of ventilation employed must take account of the Lower Explosive Limit (LEL) of the product being applied and comply with local legislative requirements. (The LEL is the minimum concentration of vapour in air, expressed as a percentage, that will ignite). International Paint recommend that this is such that vapour concentrations do not exceed 10% of the LEL. This figure is in line with general industry standards and the requirements of the United Kingdom Health & Safety Executive (Information Document HSE 703/13 “Application of Surface Coatings to Ship’s Tanks”) and the United States Department of Labor Occupational Safety and Health Administration (OSHA) regulation 1915.36(a)(2).

The ventilation requirement can be calculated from the required air quantity (RAQ) to 10% of the LEL figures and the product application rate. A typical paint application rate by airless spray is 75-100 litres (19.7-26.3 U.S. Gallons) per hour per sprayer.

Venting to 10% of the LEL is considered to provide a reasonable margin of safety to allow for possible higher local concentrations due to the complex geometry of ballast tanks. Nevertheless, care should be taken when setting up ventilation/extraction systems, to ensure that 10% figure is not exceeded.

If the level of ventilation is reduced during coating application, in order to minimise possible dry spray, the paint application rate must also be reduced to ensure that solvent vapour levels remain below 10% of the LEL.

Responsibility rests with the shipyard/contractor to ensure that the requisite equipment is available and operated in such a way that these requirements are met. International Paint will provide all of the information needed to allow the shipyard/contractor to calculate ventilation requirements. However, International Paint does not accept responsibility for the equipment, its operation, or the monitoring necessary to ensure that the requisite ventilation requirements are met.

All equipment used after the commencement of paint application must be electrically safe in operation.

Provision must be made by the contractor/shipyard for continuous, round the clock, surveillance of ventilation equipment.

### 5.4 DEHUMIDIFICATION

Dehumidification equipment, when required, must be of adequate capacity to maintain the condition of blasted steelwork to the required standard. Additionally, in order to prevent condensation, the steel temperature must always be at least 3°C (5°F) above the dew point.

Coatings may only be applied to surfaces which have been maintained in a dry condition with the steel temperature at least 3°C (5°F) above the dew point for more than one hour. The surfaces must be visibly dry and clean at the time of application. This condition must be maintained until the coating is cured.

Tank Coating must only be undertaken under acceptable atmospheric conditions, otherwise adverse effects may occur.

Refer to section 2.3.8 of this procedure for acceptable relative humidity conditions for application of Interline 975P.

Provision should be made for 24 hour surveillance of equipment.

### 5.5 HEATING

If heating is necessary to satisfy the painting specification, it should be by means of a heat exchange system, i.e. air admitted to the tank should not pass directly through a combustion chamber.

Temperatures should be maintained for the duration of the contract from application to cure and provision should be made for 24 hour surveillance of equipment by the contractor/shipyard.

### 5.6 LIGHTING

Lighting during painting must be electrically safe and provide suitable illumination for all work. As a guide, lighting may be considered suitable if this text can be read at a distance of 30 centimetres (12 inches) from the eye.

Ideally, the lighting should be powerful mains supplied spotlight with background lighting on at all times in the interests of safety.

Powerful mains spotlighting must be provided when inspection work is being carried out.

### 5.7 STORAGE (AT POINT OF APPLICATION)

The paint must be stored out of direct sunlight so that the temperature of the material will not exceed 35°C (95°F) for prolonged periods of time.

In winter months, when temperatures can be expected to fall below 10°C (50°F), base and curing agent must be stored in premises, (storeroom, hut, etc), which are heated to a temperature in excess of 10°C (50°F) for a period of not less than 48 hours immediately prior to use (unless stated otherwise on the product technical data sheet).

The curing agent darkens at elevated temperatures on storage. This can affect the colour of the product when mixed.

### 5.8 GRIT BLASTING

#### 5.8.1 General

Two main universal standards of surface preparation are normally specified for cargo tank coatings - ISO Standard ISO 8501-1 (2007) - Sa2½ and Sa3.

However, in general, the following comments apply to these standards.

Sa2½ - in practice, this is considered to be the best standard a skilled blasting operative can consistently achieve.

Sa3 - the possibility of achieving a uniform standard of Sa3 throughout the tanks is remote and a more realistic achievement would be somewhere between Sa2½ and Sa3.

#### Comparative Standards

<u>ISO 8501-1: 2007</u>	<u>Japanese Standard on new steel</u>	<u>SSPC Standard</u>
Sa2½	JA SH2	SSPC-SP10
Sa3	JA SH3	SSPC-SP5

Additionally, International Paint has identified acceptable limits of sweep blasting shop primers which may be specified after consultation with International Paint.

Pictorial representations are available; see "Abrasive Sweep Standards - For Shop Primed Steel Surfaces (Edition 3)"

In cases where the substrate is corroded or pitted, it may be necessary to fresh water wash the areas after abrasive blasting, then re-blast, in order to ensure complete removal of soluble corrosion products.

#### 5.8.2 Compressed Air

Air used for blasting must be clean, oil free and dry. The pressure should be at least 7kg/cm<sup>2</sup> (100lb/sq inch) at the nozzle.

#### 5.8.3 Abrasive

Abrasives used for blasting must be dry and free from dirt, oil, grease and suitable for producing the standard of cleanliness and profile specified. The abrasive must therefore be in accordance with the specifications given in ISO 11126 - Parts 1 to 8 and each delivery should carry a certificate of conformity to this specification.

If blasting abrasive is supplied on site without a certificate of conformity, the material should be tested by the yard or contractor in accordance with the methods given in ISO 11127 - Parts 1 to 7.

Particular attention should be given to ISO 11127 - Part 6, where the level of water soluble contaminants must not give a conductivity value greater than 25mS/m, and ISO 11127 - Part 7, where the level of water soluble chlorides must not exceed 0.0025% by weight.

Iron or steel abrasives can be used for in-situ open blasting. Specifications for metallic abrasives are given in ISO 11124 - Parts 1 to 4 and the corresponding test methods in ISO 11125 - Parts 1 to 7. If used, careful and thorough cleaning must be carried out at all stages of the operation to ensure that no abrasive remains in the tank as this may subsequently corrode.

Although not recommended, recycled grit may be used providing it is dry, has been shown to be free from contamination by dirt, oil, grease, and has been tested in accordance with the above ISO standards.

### 5.8.4 **Blast Profile**

The required amplitude of the blast profile depends upon the type of coating to be applied. Measurement on site should be by profile gauge or other mutually acceptable instruments.

Measurement of surface profile using comparators is described in ISO 8503-2 using comparators detailed in ISO 8503-1. A blast profile of 50-100 microns is required and can be measured using:

- a) ISO 8503-3: Focusing microscope
- b) ISO 8503-4: Stylus

## 5.9 **CLEANING**

Prior to initial blasting inspection, the bulk of spent grit must be removed.

Any substandard areas should be identified and must be brought up to the specified standard.

All marking paint, chalk, etc, used to identify substandard areas must be removed after substandard areas are rectified. If marking pens are used, which cannot be removed, then they must be technically approved by the International Paint Worldwide Marine Laboratories prior to any overcoating taking place.

Following provisional approval of the blast standard, all remaining traces of grit and dust must be removed from all areas using industrial vacuum cleaners fitted with brushes, or by other suitable methods agreed by International Paint. The quantity of dust remaining should be no greater than Pictorial reference 1 : ISO 8502-3 and be of no greater size than Class 2 : ISO 8502-3.

Final approval of a substrate for coating application must be confirmed after final cleaning.

Mats for wiping feet, (or overshoes), should be placed at the entrance of tanks, and the area immediately surrounding them kept in a clean condition.

### 5.10 PAIN T APPLICATION

All paints should be applied by airless spray except for stripe coats where brush or roller should in general be used.

Efficient mechanical stirrers for the correct mixing of paint must be used.

Available air pressure and capacity for spray equipment should be at least 5.5kg/cm<sup>2</sup> and 1.4m<sup>3</sup>/min (80 psi and 50 cfm).

All spray equipment must be in good working order and be capable of performing to the output requirements defined in International Paint product technical data sheets.

It is recommended that airless spray pump ratios of 60:1 or greater should be used with a maximum of 1x 3/8" diameter main line with 1 x 2m 1/4" diameter whip end. At ambient temperatures below 20°C (68°F), or where longer line lengths are required, a high volume pump, 70:1 or greater, with an in-line heater is required to assist application.

Tips should be the size stipulated on the product technical data sheet, or as agreed with the International Paint representative on site. Tips must not be in a worn condition.

When using plural component spray equipment during application, the pressure gauges on the plural pump should be constantly monitored by the operator to ensure no drops in pressure for either component. The International Paint Technical Service Representative will also, regularly check the pressures.

If application is to be suspended, the two components should be prevented from passing through the mixing capillary and solvent should be pumped through the line containing mixed paint. The pump pressure should then be reduced and circulation of the individual paint components commenced.

At the end of application, the mixing tube, spray hose and gun should be immediately cleaned by circulating solvent for 15 to 30 minutes.

Both during and following application of paint, all operatives entering the confines of coated tanks must wear soft-soled shoes or overshoes.

### 5.11 STRIPE COATS

Stripe coating is an essential part of good painting practice. Typical areas where stripe coats must be applied include:

- behind bars
- plate edges
- cut outs i.e. scallops, manholes etc
- welds
- areas of difficult access
- ladders and handrails
- small fittings of difficult configuration
- areas of pitting

Note: The above list is not comprehensive, all areas must be included. The diagrams following indicate key areas requiring stripe coating:

In general, stripe coats should be applied by brush or roller, depending upon items concerned.

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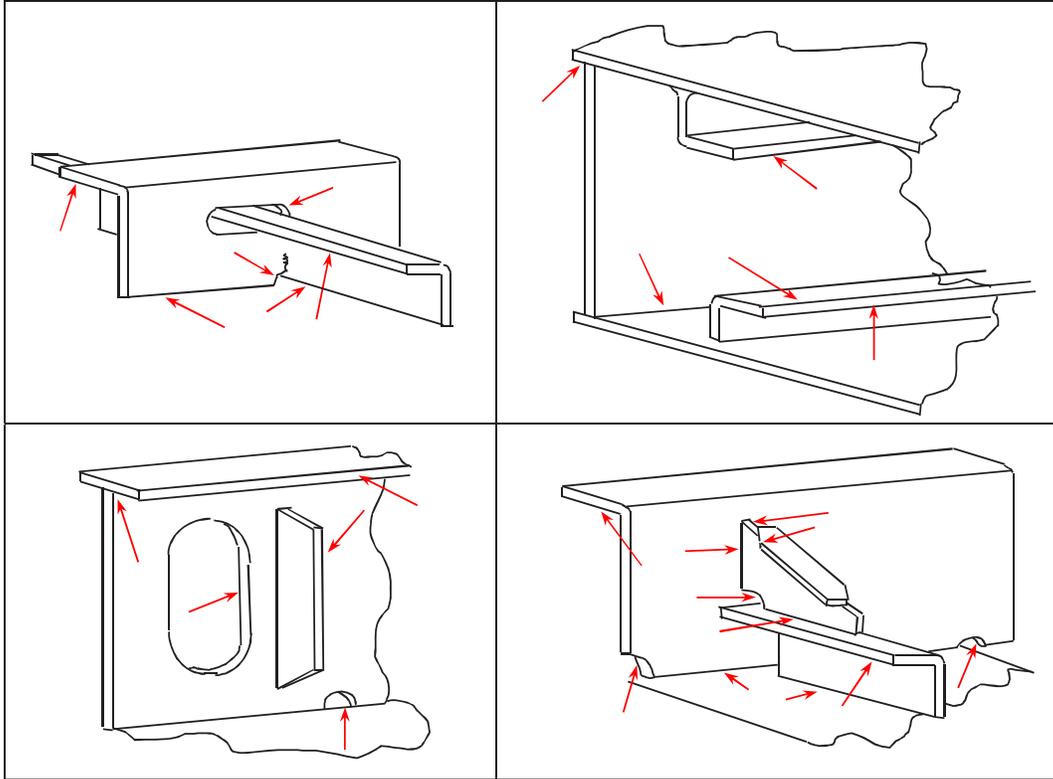
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In exceptional circumstances it may be acceptable to apply a stripe coat to the backs of angle bars by narrow angle spray. The use of spray applied stripe coats however, must be discussed and agreed with the International Paint representative on site.



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## **6. REPAIR PROCEDURES**

### **6.1 INTRODUCTION**

These repair procedures are recommended for damages either at the initial coating stage or where breakdown of coating has occurred during the service life of the vessel.

The repair procedure recommended will depend upon the extent of damage involved but can be split into:

- i) Repairs of major areas
- ii) Repairs of minor areas

### **6.2 MAJOR REPAIRS**

A Major repair should essentially be dealt with as if the project were beginning. The recommendations given earlier for steel preparation, coating application, etc. MUST all be adhered to.

### **6.3 MINOR REPAIRS**

Under this heading are repairs to areas damaged either at the initial coating stage, i.e. caused by de-staging, etc or caused during service, i.e. tank cleaning equipment damages, spot corrosion, etc. The principle requirements are:

The area to be repaired must be fresh water washed and dry.

Remove any corrosion by means of either:

- vacuum blasting
- hand tools, i.e. disc sander and grinder.

Any pittings which, in the opinion of the Classification Society, do not need re-welding, should be prepared by needle gun and/or cone shaped grinder to remove corrosion deposits.

It is not normally recommended to use filler in pittings as it is likely to detach, taking with it any paint which has subsequently been applied, thus exposing the steelwork to possible further corrosion.

If however, it is decided to use filler, it must be applied after the first coat of the system, then overcoated with the remaining coats.

Abrade area immediately surrounding repair to provide key for subsequent paint application.

Apply the paint system in accordance with our recommendations. If small areas are involved and application is by brush, several coats may be required to achieve the correct dry film thickness.

Cure time - when minor repairs have been carried out the cure time can be reduced to 75% of that recommended for full tank applications provided forced ventilation is maintained during application and the entire time of cure.

## **7. HEALTH & SAFETY**

### **7.1 INTRODUCTION**

Some tank coatings contain volatile flammable organic solvents which can form explosive mixtures with air. Definite safety precautions must be taken whilst applying this type of coating in the confines of a ship's ballast tank. Detailed attention must be given to the following points:

- Danger of explosion or fire.
- Provision of a suitable breathing environment for workers.
- Prevention of skin irritation problems.
- Use of paints which have been specially formulated for use in ballast tanks.

### **7.2 DANGER OF EXPLOSION OR FIRE**

The key factors in preventing an explosion or fire are:

- Adequate ventilation.
- Elimination of naked flames, sparks and any ignition sources.

Any organic solvent based coating could, merely by the normal process of drying, give off sufficient solvent vapour to produce an explosive mixture in a tank when the vapour concentration reaches or exceeds 1% by volume in air. However, at 1% the solvents in the coatings produce an unpleasant odour, (often with irritating skin effects) and smarting of the eyes. These symptoms must be taken as a warning sign that better ventilation is needed. 0.1% solvent vapour in air is normally recommended to give a tenfold safety margin and at this concentration, no explosion can occur and no operator effects should be noticed.

Sampling apparatus to detect the exact concentration of solvents should be used at regular intervals, particularly in "dead spots" where locally high concentrations may occur.

### **7.3 VENTILATION**

(Note: This must be read in conjunction with General Note 5.3).

Ventilation is necessary during abrasive blasting operations to ensure adequate visibility. Flexible trunking should be used to allow the point of extraction to be reasonably close to the personnel carrying out the blasting.

During and after coating application it is essential that solvent vapours are removed to ensure that the level present in the atmosphere does not rise above that recommended in the section (7.2) dealing with "Danger of Explosion and Fire". This means that the ventilation system must be arranged such that "dead spaces" do not exist and the ventilation must be continued both during the time that application is proceeding and also whilst solvent is released from the paint film during the drying process. Particular care must be taken to ensure that solvent vapour, which is heavier than air, does not accumulate in the lower areas of the tanks.

The amount of air per minute for ventilating to 10% of the LEL (lower explosive limit) can be regarded as the required air quantity multiplied by rate of application per minute. The required air quantity is the amount of air needed for each litre of paint to ventilate to the required level.

RAQ = Required Air Quantity  
LEL = Low Explosive Limit

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Ventilation required ( $\text{m}^3/\text{minute}$ ) = RAQ x the application rate (litres/minute). The likely approximate application rate can be calculated from figures available from the application equipment supplier and will depend on the airless spray pump pressure and the orifice size of the tip used.

The geometry and size of tanks makes each one a separate problem, and it is essential that the ventilation arrangement, fan type, etc is checked as being suitable before painting commences.

Wing tanks, double bottoms and double skinned vessels require special attention. Because of their construction, adequate ventilation is difficult and rapid build-up of solvent vapour and explosive concentrations may occur. It is recommended that, when workers are involved in such spaces, a careful check is kept that men are not in difficulty and that there is supervised continuity of essential services such as air and electricity.

In the event of a failure of the extraction/ventilation system paint application must be stopped and the tanks evacuated of personnel immediately.

#### 7.4 **ELIMINATION OF IGNITION SOURCES**

Safety is the overriding consideration with this type of tank coating work, and the Contractor and Crew must be made fully aware of all aspects of the operation.

Welding, cutting or grinding in the tank must be forbidden until paint fumes are totally ventilated. This also applies to all areas within a 20m (60 feet) radius of tank and trunking outlets.

Coamings and hatch openings must be covered so as to efficiently prevent spark entry where welding is being carried out on the superstructure.

Lights, including hand torches, must be certified by the manufacturer as flash proof and suitable for use in solvent laden atmospheres.

Smoking must be prohibited in or near tanks or extraction systems.

No electrical junction boxes should be allowed in tanks.

Airless spray equipment must be earthed (because of the danger of static electricity build-up)

Mobile telephones, electrical cameras, and any equipment that is not intrinsically safe, must not be used in or near tanks or extraction systems until paint fumes are totally dispersed.

#### 7.5 **SOLVENT VAPOUR AND PAINT MISTS - PROTECTION OF PAINTING PERSONNEL**

No ventilation system can reduce solvent vapour levels to below the Occupational Exposure Limit for solvents whilst tank coating is in operation. Painters must, therefore, wear air fed hoods or pressure fed masks with additional eye protection. (Please note: air fed hoods which provide a curtain of air across the visor are available. These help to prevent settlement of spray mist on the visor). Normal protective clothing must be worn, e.g. overalls, gloves, and suitable footwear of non-spark type.

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### 7.6 SKIN IRRITATION

If proper protective clothing has been worn, e.g. overalls, gloves, air fed hood, etc no discomfort should be experienced from skin irritation. Any small areas not protected by clothing, e.g. wrists or neck, can be treated with a non-greasy barrier cream. (Petroleum jelly is not recommended as this can assist the transport of solvents into the skin).

Any areas of skin accidentally contaminated with paint must be thoroughly washed with soap and water. A skin conditioner that is designed to replace the natural oils in the skin can be used.

#### Note

1. The preceding safety information is given for guidance only.
2. It is imperative that, prior to the commencement of any tank coating project, local Regulations regarding Health and Safety be consulted.

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