APPLICATION GUIDELINES

CARGO HOLDS

Intershield® 300

Revision 11

Issue Date: 14th September 2015

CONTENTS

1. SCOPE AND PURPOSE

The International Paint Cargo Hold Coatings Guidelines have been produced and revised in line with the Worldwide Marine product range for cargo hold coatings. The purpose of the guidelines is to ensure that a coating system, as applied, provides adequate protection against mechanical damage, associated with the carriage of cargoes, and subsequent corrosion.

Successful in-service performance of a cargo hold 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.

2. PRODUCT SPECIFICATION AND PRODUCT CURE GRAPHS

2.1 SURFACE PREPARATION

2.1.1 Newbuilding

Clean welds, damaged and corroded shop primer by blasting to ISO Standard 8501-1 (2007) - Sa2 1/2 or by power tooling to JRSA SPSS: 1984 - Pt3.
For PVB and unapproved shop primer grit blast to ISO Standard 8501-1 (2007) - Sa2 1/2.
For zinc and iron oxide epoxy shop primer, ensure primer is clean and dry. For optimum mechanical properties, these types of shop primers should be prepared by grit sweeping to International Paint Abrasive Sweep Standards for Shop Primed Steel Surfaces (Edition 3) - AS.2.

2.1.2 Maintenance + Repair

Abrasive blast clean to ISO Standard 8501-1 (2007) - Sa2 minimum or Water Jet to International Paint Hydroblasting Standard HB2 with flash rusting no worse than HB2M.

2.2 SPECIFICATION

	Repair Type	Hold Type	Coat	Product	Dft (microns) Spec	Min	Max	Dft (mils) Spec	Min	Max
1	Newbuilding	Dry	Full	Intershield 300	125	(100)	(250)	5	(4)	(10)
	or	or	Stripe*	Intershield 300						
	Major Refurbishment	Ballast	Full	Intershield 300	125	(100)	(250)	5	(4)	(10)
2	Newbuilding	Dry	Full	Intershield 300	150	(125)	(300)	6	(5)	(12)
		or	Stripe*	Intershield 300						
		Ballast	Full	Intershield 300	150	(125)	(300)	6	(5)	(12)
3	Newbuilding	Dry	Full	Intershield 300	175	(150)	(350)	7	(6)	(14)
		or	Stripe*	Intershield 300						
		Ballast	Full	Intershield 300	175	(150)	(350)	7	(6)	(14)

* Either one or two stripe coats may be applied depending upon customer requirements.

At major refurbishment Intergard 269, at 40 microns dft, may also be applied as a holding primer if required to protect the blast. Refer to technical datasheet for thinner recommendations and overcoating intervals.

2.3 NOTES

2.3.1 Refer to the accompanying graphs for recommended overcoating intervals and curing requirements.

2.3.2 The drying times quoted for Intershield 300 refer to a single coat applied to give 150 microns (6 mils) dry film thickness. At higher film thicknesses drying times may be extended, particularly at low temperature.

2.3.3 Touch up during destaging is to be done by brush to the minimum dry film thickness of thickness shown in section 2.2.

2.3.4 All thicknesses are to be checked by the International Paint Technical Service Representative on site (if present). Any substandard areas are to be rectified.

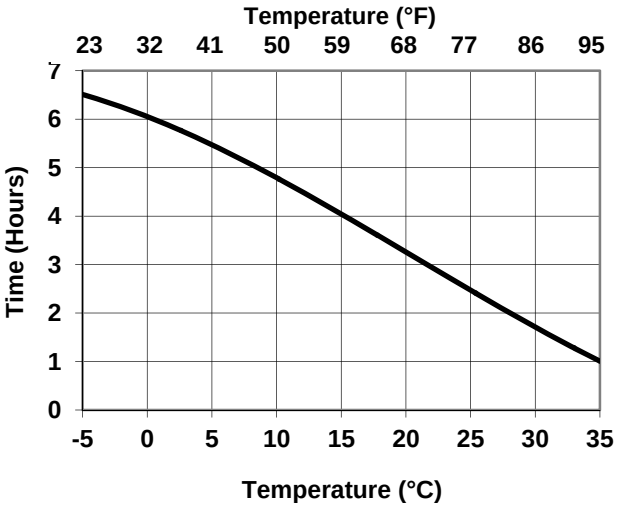
2.3.5 For minimum application temperatures, see section 5.13.
2.3.6 Steel temperature should not exceed 40°C (104°F) during application.
2.3.7 Areas of overspray are to be sanded down prior to overcoating.

2.4 PRODUCT CURE GRAPHS

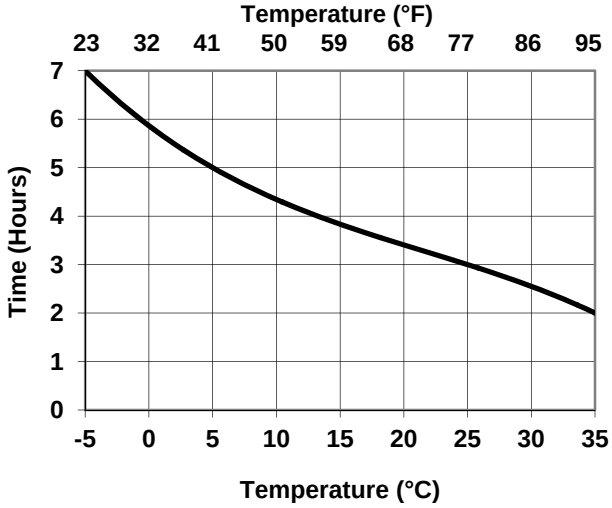
2.4.1 Pot Life
2.4.2 Touch Dry Times
2.4.3 Hard Dry Times
2.4.4 Minimum Overcoating Intervals (full coat)
2.4.5 Minimum Overcoating Intervals (stripe coat)
2.4.6 Maximum Overcoating Intervals (stripe coat and full coat)
2.4.7 Time to Loading First Cargo

See section 5.13 for projects where application is to take place below -5°C.

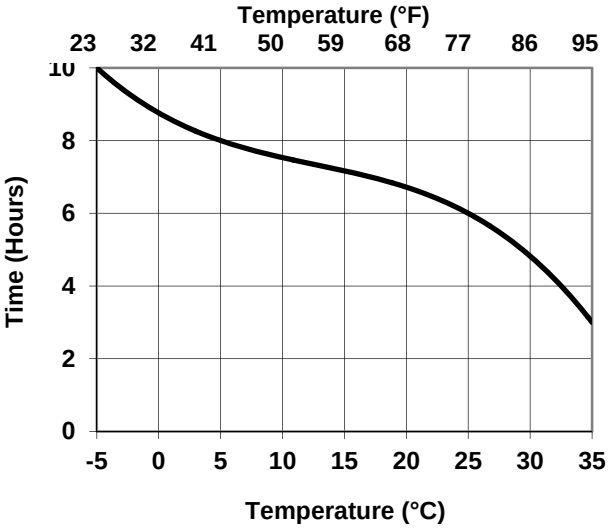
Intershield 300: Pot Life



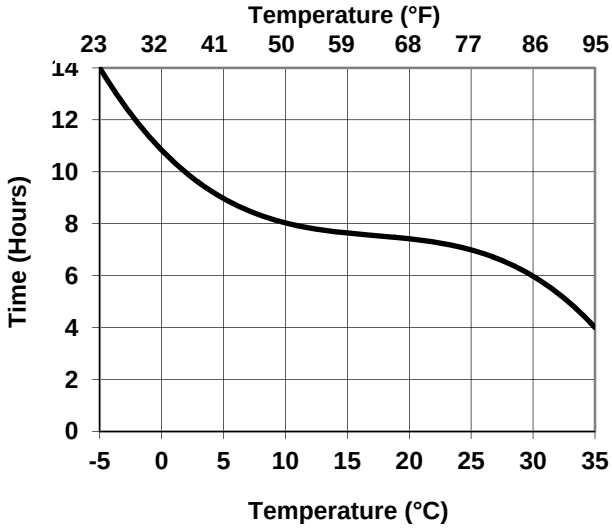
Intershield 300: Touch Dry



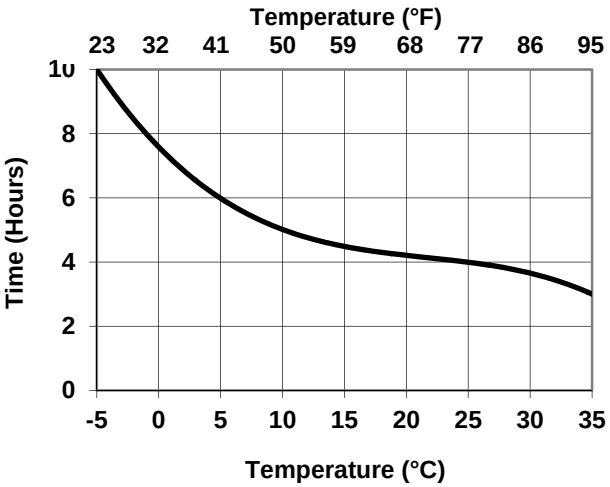
Intershield 300: Hard Dry



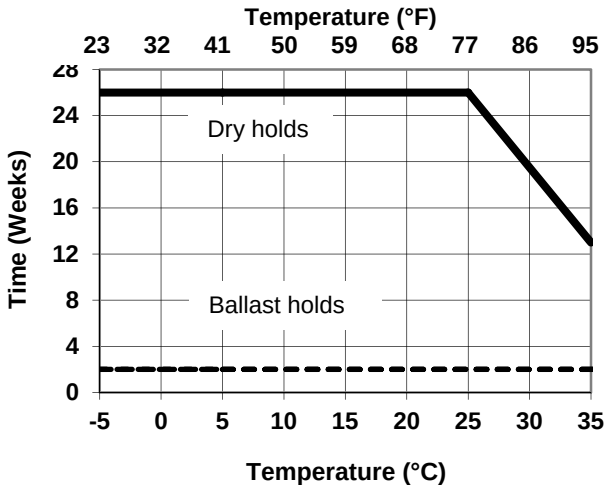
Intershield 300: Minimum Overcoating (Full coat)



Intershield 300: Minimum Overcoating (Stripe Coat)

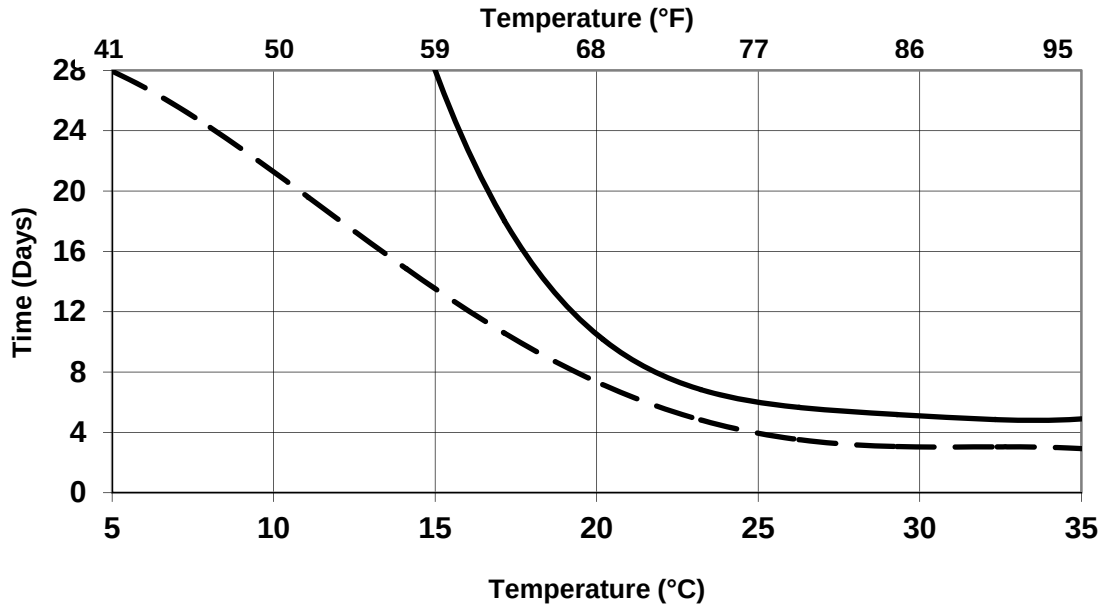


Intershield 300: Maximum Overcoating



Note: The maximum overcoating intervals for Intershield 300 are shorter in Japan/Korea. Please refer to local datasheets for further information.

Intershield 300: Time to Loading First Cargo



Notes

The above graph shows time to cargo loading for two types of cargo and ballast water:

a) Aggressive/Hard cargoes (e.g. coal, iron ore, scrap metal, bauxite)
b) "Soft" cargoes (e.g. grain, fertilizers, paper, china clay, potash) & Ballast water

The data is based on the time after which the coating suffers less than 1% total damage when subjected to a cargo of coal at a pressure of 300 KPa. When the temperature during curing is less than 15°C (59°F), aggressive/hard cargoes should not be loaded as the first cargo in holds coated with Intershield 300. For further information, consult International Paint.

Data for "soft" cargoes has been estimated based on the above test and on experience gained over many years of cargo hold coating applications. Intershield 300 requires a minimum curing temperature of 5°C (41°F) prior to loading of the first cargo.

The times given for time to load ballast water represent the time necessary for the coating to achieve sufficient cure to resist solid cargoes which may be carried subsequently.

In order to be able to resist damage caused by the loading of cargo, coatings need to be allowed to cure over a period of days. During this time, the coating achieves its maximum resistance to mechanical damage. The rate at which this occurs varies depending upon several factors:

- The nature of the coating itself.
- Temperature - at low temperatures a longer curing time is required. The time to loading graph assumes that temperature remains constant throughout the drying/curing process. Due allowance should be made for any temperature drop which may occur, e.g. overnight.
- Ventilation conditions - it is vital that the coating is allowed to cure in good ventilation conditions, i.e. for in-situ applications the hatch covers should be open for the full curing period. Closing of hatch covers will result in an extension of the time required prior to cargo loading.
- Film thickness - coating application at a film thickness significantly greater than that specified will reduce the rate of achievement of mechanical properties

3. COATING APPLICATION PROCEDURES

3.1 FOR IN-SITU NEWBUILDING APPLICATIONS

3.1.1 If scaffolding is to be used, erect. Refer to Section 5.3 for recommendations.

3.1.2 Remove weld spatter and grind sharp edges and uneven welds until smooth.

3.1.3 Ensure intact shop-primer (if to remain) is clean, dry and free from contamination. If necessary wash with detergent / fresh water. Any detergent used should be neutral and fresh water rinsable to ensure total removal of contamination.

3.1.4 Grit blast welds, damages and areas of corrosion to ISO Standard 8501-1 (2007) - $Sa2^1/_2$, or power tool clean to JRSA SPSS: 1984 - Pt3.

3.1.5 Grit blast PVB or unapproved shop primer to ISO Standard 8501-1 (2007) - $Sa2^1/_2$. If to be removed to provide optimum mechanical properties, grit sweep approved shop primer to the specified standard.

3.1.6 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.

3.1.7 All marked areas shall be brought up to the specified standard of preparation. The whole blasted area is to be cleaned to remove dust and contamination.

3.1.8 For ballast holds only, measurement of salt contamination should be carried out prior to coating, see section 3.4 of this procedure.

3.1.9 Apply the coating scheme as specified in section 2.2 of this procedure. Observe the specified, maximum and minimum dry film thickness.

Stripe coats should be applied to areas itemised in section 5.15 of this procedure.

Prior to overcoating, each full coat and each stripe coat is to be inspected by the International Paint Technical Service Representative.

Prior to application of subsequent coats, ensure surfaces are clean and dry.

3.1.9 Once the full system has been applied, and has been accepted by the Contractor Quality Control Department, the International Paint Technical Service Representative will check the dry film thickness.

3.1.10 Any areas of under thickness are to be brought up to the minimum thickness specified.

3.2 FOR NEWBUILDING APPLICATIONS AT BLOCK STAGE

At Block Stage

3.2.1 Remove weld spatter and grind sharp edges and uneven welds until smooth.

3.2.2 Ensure intact shop-primer (if to remain) is clean, dry and free from contamination. If necessary wash with detergent / fresh water. Any detergent used should be neutral and fresh water rinsable to ensure total removal of contamination.

3.2.3 Grit blast welds, damages and areas of corrosion to ISO Standard 8501-1 (2007) - $Sa2^1/_2$, or power tool clean to JRSA SPSS: 1984 - Pt3.

3.2.4 Grit blast PVB or unapproved shop primer to ISO Standard 8501-1 (2007) - Sa2 1/2. If to be removed to provide optimum mechanical properties, grit sweep approved shop primer to the specified standard.

3.2.5 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.

3.2.6 All marked areas shall be brought up to the specified standard of preparation. The whole blasted area is to be cleaned to remove dust and contamination.

3.2.7 For ballast holds only, measurement of salt contamination should be carried out prior to coating, see section 3.4 of this procedure.

3.2.8 Apply the coating scheme as specified in section 2.2 of this procedure. Observe the specified, maximum and minimum dry film thickness. Leave a 15 centimetre (6 inch) gap from the plate edge.

Stripe coats should be applied to areas itemised in section 5.15 of this procedure.

Prior to overcoating, each full coat and each stripe coat is to be inspected by the International Paint Technical Service Representative.

Prior to application of subsequent coats, ensure surfaces are clean and dry.

3.2.9 Once the full system has been applied, and has been accepted by the Contractor Quality Control Department, the International Paint Technical Service Representative will check the dry film thickness.

3.2.10 Any areas of under thickness are to be brought up to the minimum thickness specified.

After Erection

3.2.11 Ensure the surfaces to be painted are clean, dry and free of all contamination.

3.2.12 Prepare join-up areas, areas of damage and corrosion to the specified standard.

3.2.13 Lightly disc / abrade 15 centimetres (6 inches) of the edge of the existing coating applied at block stage to provide a key for overcoating on overlap areas. Ensure surfaces are clean and free from debris.

3.2.14 To these areas, apply the coating scheme as specified in section 2.2 of this procedure. Observe the specified, maximum and minimum dry film thickness.

Stripe coats should be applied to areas itemised in section 5.15 of this procedure.

Prior to overcoating, each full coat and each stripe coat is to be inspected by the International Paint Technical Service Representative.

Prior to application of subsequent coats, ensure surfaces are clean and dry after stripe coating and inspection procedures.

3.2.15 Once the full system has been applied, and has been accepted by the Contractor Quality Control Department, the International Paint Technical Service Representative will check the dry film thickness

3.2.16 Any areas of under thickness are to be brought up to the minimum thickness specified. This must be carried out within the overcoating limits specified for the product.

3.3 FOR APPLICATIONS AT MAJOR REFURBISHMENT

3.3.1 If scaffolding is to be used, erect. Refer to Section 5.3 for recommendations.

3.3.2 For any new steel fitted during refurbishment, remove weld spatter and grind sharp edges and uneven welds until smooth.

3.3.3 Fresh water wash to remove all dirt and contamination as necessary. Degrease area according to SSPC-SP1 solvent cleaning.

3.3.4 Carry out surface preparation as specified in section 2.1. If water jetting is carried out, refer to section 5.10 of this procedure for detailed instructions. It is permissible for the water jetted areas to be allowed to flash rust to HB2M prior to application of Intershield 300.

3.3.5 Upon completion of abrasive blasting or water jetting, and after inspection by the Contractor Quality Control Department, the International Paint Technical Service Representative (if present) will also inspect the whole area and mark up any substandard areas.

3.3.6 All marked areas shall be brought up to the specified standard of preparation. If applicable the whole blasted area is to be vacuum cleaned to remove dust and contamination.

3.3.7 For ballast holds only, measurement of salt contamination should be carried out prior to coating, see section 3.4 of this procedure.

3.3.8 Apply the coating scheme as specified in section 2.2 of this procedure. Observe the specified, maximum and minimum dry film thickness.

Stripe coats should be applied to areas itemised in section 5.15 of this procedure.

Prior to overcoating, each full coat and each stripe coat is to be inspected by the International Paint Technical Service Representative (if present).

Prior to application of subsequent coats, ensure surfaces are clean and dry after stripe coating and inspection procedures.

3.3.9 Once the full system has been applied, and has been accepted by the Contractor Quality Control Department, the International Paint Technical Service Representative (if present) will check the dry film thickness.

3.3.10 Any areas of under thickness are to be brought up to the minimum thickness specified.

3.4 MEASUREMENT OF SALT CONTAMINATION PRIOR TO COATING

The procedure below should be used in the case of ballast holds and can be used in conjunction with the above application procedures.

3.4.1 Prior to coating the prepared (e.g. gritblasted) surface, measure the amount of residual salt using the Bresle patch method (ISO 8502-6: 2006) or similar. The number of tests to be carried out will depend upon the size of the area and should be agreed before the contract begins.

3.4.2 If the result is less than 10 microgrammes / cm^2 painting can proceed.

3.4.3 If the result is greater than 10 microgrammes / cm^2 the area should be fresh water washed and, when dry, the salt contamination level re-measured.

3.4.4 This washing process is to be repeated if the level is again greater than 10 microgrammes / cm^2.

3.4.5 The entire area should then be re-blasted to the specified standard and the salt contamination measurement process (3.4) repeated.

4. TECHNICAL INSPECTION AND PROJECT CONTROL

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

All parties involved in the cargo hold 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 (if present) should supervise initial mixing of the first drums of product to be applied to ensure that all parties are aware of mixing and application characteristics.

Daily briefings should be arranged to confirm performance of the work and inspection schedules, minutes of these briefings should be taken and circulated to all participants.

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 hold coating system on the areas concerned. 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.

NOTE: When measuring the dry film thickness of coatings, the d.f.t. gauge must be calibrated prior to use as follows:

1. Check that the probe is clean.
2. Place the probe on a sample of millscale-free **smooth** steel of thickness greater than 1mm.
3. Calibrate the instrument to zero.
4. Select a certified shim of similar thickness to that expected for the coating under test.
5. Calibrate the gauge to the shim thickness.
6. Check that the gauge reads zero when replaced on the smooth steel sample.

Measurement of dry film thickness is described in ISO Standard 2808:2007.

5. GENERAL NOTES

5.1 HOLD CONDITION

Prior to commencement of surface preparation it is essential that holds, or block sections, are clean, dry, and in a condition suitable for surface preparation and application of the cargo hold coating. The following briefly outlines the minimum requirements:

5.1.1 Newbuilding

- The shop or pre-construction primer must be compatible with the proposed paint system.
- All grease and oil must be removed from all surfaces (SSPC-SP1).
- All hot work should be complete, except for join up welds if block stage coating procedures are adopted.
- If preparation and coating is to be carried out after erection, holds must be degreased, fresh water washed and dried 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 Maintenance and Repair

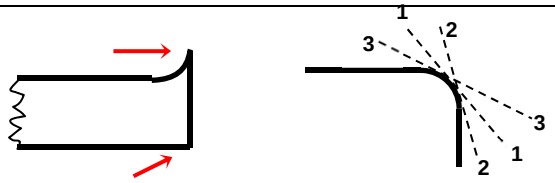
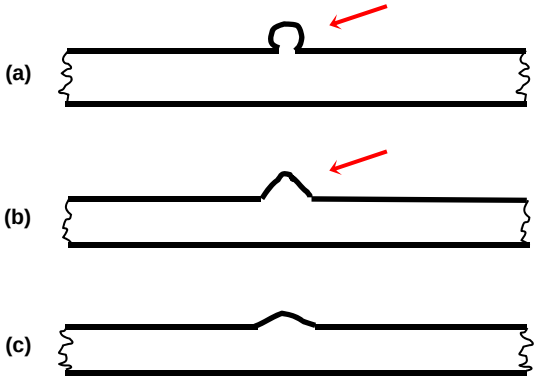
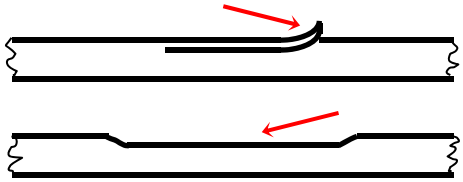
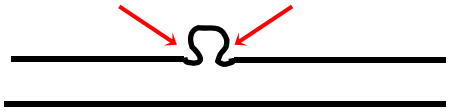
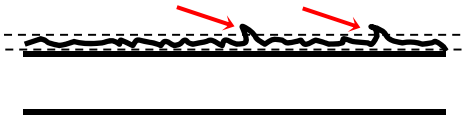
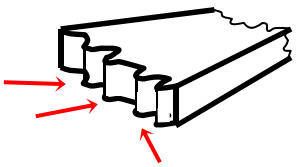
Holds must be cleaned as outlined below and be gas free (e.g. OBO's).

- If present, heavy scale must be removed from all surfaces.
- Debris and cargo residues must be completely removed from all surfaces.
- All grease and oil must be removed from all surfaces (SSPC-SP1).
- All hot work should be complete.
- Any blisters present must be broken and blister caps removed from surface prior to washing by appropriate means.
- Holds must be thoroughly fresh water washed and allowed to dry.

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	**Remove sharp edges or gas cutting edges with grinder or disc sander:** 
Weld Spatter	**1. Remove spatter observed before blasting by grinder, chipping hammer etc.** **2. For spatter observed after blasting:** **a) Remove with chipping hammer /scraper etc.** **b) Where spatter is sharp, use disc sander or grinder until obtuse** **c) Obtuse spatter – no treatment required** 
Plate Lamination	**Any lamination to be removed by grinder or disc sander** 
Undercut	**Where undercut is to a depth exceeding 1mm and a width smaller than the depth, repair by welding or grinding may be necessary** 
Manual Weld	**For welding bead with surface irregularity or with excessive sharp edges, remove by disc sander or grinder** 
Gas Cut Surface	**For surfaces of excessive irregularity, remove by disc sander or grinder** 

5.3 SCAFFOLDING

Tubular scaffolding must not mask surfaces to be coated. Where contact is necessary then spade ends should be used.

Staging must afford easy and safe access to all surfaces to be coated, but should be at least 15cm to 30cm (6" to 12") from vertical surfaces which are to be coated. The distance between staging levels should not exceed 2 metres (6.5 feet).

Tubular scaffolding must be plugged or capped prior to grit blasting to prevent the ingress of grit and dirt.

Staging should be designed to allow thorough cleaning. Where scaffolding is wooden, International Paint recommend that staging be of the 'turn over' type, when local safety regulations permit.

If fixed staging lugs are fitted, these should be stainless steel.

Staging layout should be such that ventilation is not rendered ineffective.

Care must be taken when removing scaffolding in order to keep damages to a freshly applied coating to a minimum. Any damages should be repaired in accordance with the recommendations of the International Paint Technical Service Representative on site.

If mobile platforms or "cherry pickers" are used, they must be capable of providing access to all parts of the cargo hold to be prepared and coated. The operatives should not have to lean or stretch excessively to gain suitable access.

5.4 VENTILATION

During in situ applications, the hatch covers should be open and forced ventilation (via flexible trunking) should be in place and remain operational for at least 24 hours after completion of coating application.

Solvent vapours are generally heavier than air and therefore the ventilation system and trunking must be capable of extending to the lowest parts of the hold. Trunking should be arranged such that continuous air movement occurs in all areas and no dead spaces exist.

The ventilation system must prevent the vapour concentration exceeding 10% of the Lower Explosive Limit (or less than this if required by local regulations). The minimum ventilation requirement should be calculated from the RAQ (to 10% of the LEL) and the paint application rate.

If, for any reason, the hatch covers cannot be open during coating (e.g. as a result of bad weather) the same ventilation requirements are needed and must be maintained for at least 48 hours after the application of the system.

Equipment must be electrically safe in operation and be arranged so as not to re-introduce abrasive dust, solvent vapour, etc, into the hold.

Provision must be made for 24 hour surveillance of ventilation equipment.

5.5 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.

Provision should be made for 24 hour surveillance of equipment.

5.6 HEATING

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

Provision should be made for 24 hour surveillance of equipment.

5.7 LIGHTING

Lighting during surface preparation and 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 at all times in the interests of safety.

5.8 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 5°C (41°F), base and curing agent must be stored in premises, (storeroom, hut, etc), which are heated to a temperature in excess of 5°C (41°F) for a period of not less than 48 hours immediately prior to use (unless stated otherwise on the product technical data sheet).

5.9 GRIT BLASTING

5.9.1 General

Two main universal standards of surface preparation are normally specified for cargo hold coatings - ISO Standard ISO 8501-1 (2007) - Sa2 and Sa2½.

Comparative Standards

ISO 8501-1: 2007	Japanese Standard on new steel	SSPC Standard
Sa2	Not applicable	SSPC-SP6
Sa2½	JA SH2	SSPC-SP10

Additionally, International Paint has identified acceptable limits of sweep blasting 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.

5.9.2 Compressed Air

Air used for blasting must be clean, oil free and dry. The pressure should be at least 7kg/cm² (100lb/sq inch) at the nozzle.

5.9.3 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.

5.9.4 Blast Profile

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

Measurement of surface profile using comparators is described in ISO 8503-2. The comparators themselves are described in ISO 8503-1. A medium 'G' type comparator should be used and a value of 60-90 microns is acceptable when measured by:

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

When using a needle gauge such as the Elcometer 123, a value of 100 microns, taking a maximum of 10 determinations, is ideal.

5.10 WATER JETTING (HYDROBLASTING)

Only clean fresh water is to be used for water jetting. Salt water is unacceptable for substrate preparation. Chemical corrosion inhibitors must **not** be added to blasting water. See note 5.6 of the International Paint Hydroblasting Standards. For ballast holds, in order to achieve acceptable residual salt levels (see section 3.4), water of a conductivity of no greater than 400 microSiemens should be used.

For dry holds, all areas are to be prepared by water jetting to a minimum standard of HB2 'Thorough Hydroblast Cleaning' from the International Paint Hydroblasting Standards. This states:

"When viewed without magnification, the surface shall be free from visible oil, grease, dirt and from most of the rust, paint coatings and foreign matter. Any remaining contamination and staining shall be firmly adhered. See notes 5.9 and 5.10".

For ballast holds, all areas are to be prepared by water jetting to a minimum standard of HB2$^{1}/_{2}$ 'Very Thorough Hydroblast Cleaning' from International Paint Hydroblasting Standards. This states:

"When viewed without magnification, the surface shall be free from visible oil, grease, dirt, loose rust, paint coatings and foreign matter except for staining. A brown-black discoloration of ferric oxide may remain as a tightly adherent thin film on corroded and pitted steel. See notes 5.9 and 5.10".

A test area will be blasted before the main hold, and inspected before flash rusting has occurred. See note 5.3 of the International Paint Hydroblasting Standards. Agreement will be reached by the Owner's representative, the International Paint representative (if present) and the Contractor's representative on the agreed standard before the main hold area is prepared by water jetting.

Areas such as the edges of 'mouse holes' and scallops will be very difficult to water jet. It is advisable to mechanically clean these areas to ISO 8501-1(2007) - St3 after water jetting.

Islands of intact paint will only be allowed to remain by agreement with all parties, Owners, International Paint (if present) and Contractor. The surface of intact paint will be scoured by water jetting to produce a 'keyed' surface suitable for overcoating, and edges will be feathered back from a firm edge.

Rust, scale and old paint debris must be removed from the hold prior to inspection and mark-up by the Contractor's Quality Control Department. The International Paint representative (if present) will then inspect the whole area and mark up any substandard areas.

All marked areas shall be reblasted and brought up to the required standard.

If flash rusting is too heavy, it can be removed by high pressure washing. Upon drying, the surface must have an acceptable level of flash rusting for overcoating. See note 5.7 from the International Paint Hydroblasting Standards.

5.11 CLEANING

Prior to initial blasting inspection, the bulk of spent grit must be removed. When preparing surfaces by other means, e.g. water jetting, all traces of debris should 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.

Following provisional approval of the blast standard, all remaining traces of grit and dust must be removed from all areas including scaffolding, 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.

5.12 PAINT APPLICATION

Efficient mechanical stirrers, or power agitators, for the correct mixing of paint must be used.

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

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

It is recommended that airless spray pump ratios of 40:1 or greater should be used. Tips should be the size stipulated on the product technical data sheet, or as agreed with the International Paint Technical Service Representative on site. Tips must not be in a worn condition.

5.13 LOW TEMPERATURE APPLICATION

Intershield 300 may be applied at substrate temperatures down to -15°C. Care must be taken to avoid over application and windy conditions during application as this may lead to ‘checking’ or ‘crazing’ on the surface at temperatures below -5°C. Also consideration of the overcoating times must be given at temperatures below -5°C as the system will require higher temperatures to achieve full cure.

For further advice please refer to the Application of Newbuilding Schemes at Temperatures below the Minimum Stated on Product Data Sheets and Down to -15°C Application Guidelines.

5.14 DRY FILM THICKNESS

For optimum performance, close control of film thickness is essential. Over application may result in slow cure and solvent entrapment whilst under application can lead to reduced substrate protection or reduced in-service performance.

As a guide, the minimum dry film thickness of a high-build cargo hold coating scheme should be 85% of the specified figure.

The maximum dry film thickness should not be in excess of double the specified figure (both per coat and for the scheme). In way of areas which are difficult to paint due to their configuration (e.g. heavily stiffened bulkheads) where a degree of overthickness is unavoidable, an excess thickness of 10% over this maximum figure is acceptable. For example, for a 2 x 125 micron (2 x 4.9 mils) scheme, the maximum total dry film thickness applied to difficult areas must not exceed 550 microns (21.7 mils).

5.15 STRIPE COATS

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

- backs of stiffeners
- cut outs i.e. scallops etc
- welds
- areas of difficult access (corners etc.)
- ladders and handrails
- areas of properly prepared pitting

Key areas to receive stripe coating in cargo holds are:

- welded areas of frame feet and bracket toes
- welded areas on hatch comings
- all welded areas on bulkhead corrugations
- welds between hopper sloping plate and tank top
- connection of bulkhead stool and hopper sloping plate

In general, stripe coats should be applied by brush or roller, depending upon items concerned.
In exceptional circumstances it may be acceptable to apply a stripe coat to the backs of stiffeners by narrow angle spray. The use of spray applied stripe coats however, must be discussed and agreed with the International Paint Technical Service Representative on site.

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. cargo induced damage, subsequent corrosion, etc. The principle requirements are:

The area to be repaired must be fresh water washed to remove all salt contamination and any remaining cargo residue.

Degrease according to SSPC-SP1 solvent cleaning to remove oil, dirt etc.

The area to be repaired must be dry.

Remove any corrosion by means of either:

- vacuum blasting
- water jetting
- mechanical cleaning, 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.

Abrade coated area immediately surrounding repair to provide a 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.

Consult International Paint for details on minimum curing times prior to cargo loading/service entry following coating repairs.

7. HEALTH & SAFETY

7.1 INTRODUCTION

Most cargo hold 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 hold. 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.

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 product an explosive mixture in a hold when the vapour concentration reaches or exceeds 1% by volume in air. However, at 1% the solvents in the coatings produce an intolerably 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

During gritblasting operations, ventilation may be necessary to allow adequate visibility. Flexible ventilation trunking should be used to allow the point of extraction to be reasonably close to the blaster.

Whilst painting, it is essential that solvent vapour is removed to ensure that the level in the atmosphere does not rise above that recommended in the section dealing with 'Danger of Explosion or Fire'. The ventilation system should be arranged such that 'dead spaces' do not exist and the ventilation must be continued during paint application, and also whilst solvent is released from the drying paint film.

The amount of air per minute to ventilate 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

Ventilation required (m^3/minute = RAQ x the application rate (litres/minute)). The application rate is the maximum application rate achieved and hence, normally, the full capacity of the airless spray pump(s) would be taken as the value.

The variation in geometry and size of holds make it essential that the ventilation arrangement, fan type, etc are checked as being suitable before painting commences.

7.4 ELIMINATION OF IGNITION SOURCES

Safety is the overriding consideration with this type of hold coating work, and the Shipyard Safety Department must be made fully aware of all aspects of the operation.

Welding, cutting or grinding in the hold should be forbidden until paint fumes are totally dispersed. This also applies to all areas within a 20 metre radius of the hold and trunking outlets.

Care must be taken to prevent spark entry where welding is being carried out on adjacent areas such as superstructure, decks etc..

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 holds or extraction systems.

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

Mobile telephones and electrical cameras must not be used in or near holds 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 coating application is in operation. Painters must, therefore, wear air fed hoods or pressure fed masks with additional eye protection. Air- fed hoods which provide a curtain of air across the visor are available and 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.

7.6 SKIN IRRITATION

If the correct 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.

7.7 WATER JETTING HAZARDS

Water Jetting uses water at pressures between 8,000 and 40,000 psi (564-2820 kg/cm²) and it is consequently dangerous. Water at these high pressures has sufficient energy to cut through materials such as concrete or wood if the nozzle jet is in close proximity to the surface. There is an obvious hazard here for the operator, so all equipment must have safety features such as a trigger release for cutting off the water supply to protect operators, and operators themselves must be fully trained before using this equipment.

The water energy is dissipated within a short distance from the lance and is no longer dangerous. However, people working in the vicinity are advised to wear safety spectacles. A face mask is also recommended to prevent inhalation of contaminants borne on the fine spray produced by water jetting. Line bursts at these high pressures are dangerous and although hoses are made from very tough material, people are advised to stay clear.

Note

1. The preceding safety information is given for guidance only.

2. It is imperative that, prior to the commencement of any hold coating project, local Regulations regarding Health and Safety be consulted.