CARGO RESISTANCE GUIDE NOTES

Revision 46
Issue Date: 4th June 2018

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GENERAL NOTES

(A) INTRODUCTION

International Paint provides guidance on the resistance of cargo tank coatings to those cargoes which are commonly shipped in bulk quantities.
Guidance is available for the acceptability of cargoes in tanks coated with:

- Interline® 9001
- Interline® 994
- Interline® 994LT
- Interline® 944
- Interline® 904
- Interline® 704
- Interline® 644
- Interline® 605
- Interline® 604
- Interline® 344
- Interline® 104
- Intershield® 300/300V

An explanation of the notations against each cargo is as follows:

✓	Cargoes acceptable without restriction.
✓(note)	Cargoes acceptable subject to the conditions of the specific cargo notes itemised e.g. "✓ **1, 4"** - acceptable provided the requirements of Notes 1 and 4 are met.
✘	Unacceptable.
NT	Cargo has not been tested or testing is underway but incomplete.

Recommendations are based on 100 days continuous laboratory testing, long-term cargo sequence tests, and practical experience.

For optimum performance, the coating systems included in the Cargo Resistance Guide must not be applied over prefabrication shop primers.

Cargoes in this guide are listed alphabetically except where prefixed by a numeric which then takes precedence; however it should be noted that there is a distinction between 'Proper Shipping Names' and 'Synonyms'.

'Proper Shipping Names' are those cargo names that have been designated by the IMO for each cargo. These names are in upper case. The guide allows users to view these names only if required.

'Synonyms' are all of the other names by which a particular cargo may be known. These names are in lower case. For example, METHYL ALCOHOL is a Proper Shipping Name. However this cargo is also known as methanol, methyl hydroxide, pyroxylic spirit, wood alcohol etc – these are Synonyms.

The cargo resistance notation of any cargo with a Proper Shipping Name will be identical to its accepted synonym(s).

Specific 'Chemical' or individual 'Proper Shipping Names' should be used where available. Groups of chemicals such as ETHYLENE GLYCOL MONOALKYL ETHERS (Proper Shipping Name) may show different (more stringent) notations than individual cargoes, as the group notations need to cover all individual chemical requirements.

(B) IMO SHIP TYPE

The numbers 1, 2 or 3 indicate ship types 1, 2 or 3 respectively as defined in the International Maritime Organisation (IMO) "Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk" (IBC Code).

These are taken from the 2007 edition of the publication and are given for guidance only.

The notation "-" indicates that the cargo is listed in Chapter 18 as falling outside of the scope of the code.
A blank space indicates that the cargo is not listed by the IMO.

A check should be made with the IMO to confirm current classification. International Paint will not accept responsibility for changes to the specification of cargoes, or the conditions under which they are carried, as a result of changes in classification by IMO.

(C) SHOP PRIMERS

The resistance quoted in the guide refers to the coating system being applied directly to steel that has been prepared to the standard quoted on the product data sheet. For any other standard of surface preparation or substrate consult International Paint.

(D) CARGO TEMPERATURE

For cargoes other than those mentioned below, the carriage temperature should not exceed 35°C.

Cargoes which are viscous liquids or semi-solids at normal temperatures, and which are heated to facilitate loading and unloading, have been tested at elevated temperatures.

For most animal and vegetable oils/fats a maximum carriage temperature of 60°C must be observed.

In the case of aliphatic petroleum products, e.g. crude oil, waxes, a maximum carriage temperature of 70°C will be accepted.

Actual loading and unloading may be carried out at temperatures 10°C higher than the carriage temperature. However, the time at these higher temperatures should be kept as short as possible and in any case must not exceed 48 hours. For Interline® 994, Interline® 994LT and Interline® 9001 this can be extended to 5 days. Consideration must be given to the effect on the cargo quality that this extended period at high temperature may have.

Carriage or loading/unloading at higher temperatures may be acceptable depending on the chemical composition of the cargo involved. International Paint should be consulted when carriage/handling at higher temperatures than those indicated is required. Due consideration must also be given to temperatures of cargoes in adjacent tanks when loading.

(E) CARGO CONTAMINATION

(i) Contamination from Interline® 944, Interline® 994, Interline® 994LT, Interline® 9001, Interline® 904, Interline® 704, Interline® 604 and Intershield® 300/300V is, in practical terms, only significant in a very few cases, and is normally limited to the first few cargoes after application of the coating. Sensitive cargoes include high purity, penetrating chemicals and foodstuffs. Such cargoes should be avoided in the early life of the coating system.

(ii) Great care must be taken to ensure that tank cleaning is properly carried out between cargoes for Interline® 944, Interline® 994, Interline® 994LT, Interline® 9001, Interline® 904, Interline® 704, Interline® 604 and Intershield® 300/300V and residues of cargo are not left on the coating. These are a potential source of contamination for subsequent cargoes. In addition, chemical reactions between cargoes may well result in the formation of aggressive species, which may cause breakdown of the coating system.

(iii) Since some absorption of low molecular weight cargoes into organic coatings is unavoidable, it is recommended that particular care is taken regarding cargo sequencing. High purity and penetrating cargoes should not be carried if there is a danger of contamination of that cargo by traces of previous cargoes in the coating.

International Paint does not accept responsibility for coating breakdown or cargo contamination arising as a consequence of retained cargoes.

(F) BEVERAGES AND POTABLE LIQUIDS

The coating systems itemised in this Cargo Resistance Guide are resistant to many of these cargoes . However, International Paint does not accept responsibility for any taste or odour imparted to these cargoes from the coatings or any cargoes retained within the coatings.

(G) COATING DISCOLOURATION

Some cargoes may cause discolouration of the surface of the coating under certain carriage conditions. Coatings may also become discoloured by dyes etc. which are added to cargoes (e.g. to petroleum products for tax exemption purposes). Whatever the cause, this colour change does not normally affect the chemical resistance properties of the coating.

Inert gas systems may deposit material on the coating surface and cause discolouration and possible contamination of future cargoes, to minimize this inert gas systems should be operated correctly

Cleaning chemicals are available which may remove surface discolouration and thorough cleaning of the surface may be required to minimise any effect this may have on subsequent cargoes.

International Paint does not accept responsibility for discolouration of the coating caused by cargoes or the effect of this on subsequent cargoes.

(H) TANK CLEANING

International Paint does not advise on methods of tank cleaning between cargoes except where damage may be caused by tank cleaning. Expert advice should be sought from one of the specialist tank cleaning companies.

Several factors must be borne in mind when tank cleaning is being carried out:

(i) For volatile water miscible cargoes -

- It is essential that all liquid cargo is removed from the tank immediately after unloading
- The tank must then be vented to remove as much of the remaining cargo as possible (see Cargo Notes 1 and 4). The tank should be in a steady 'gas free condition' before washing commences.
- For Interline 9001early water contact, prior to ventilation to gas free conditions, is acceptable as follows:
    - Maximum of 3 hours at ambient temperature, following carriage of annex 1 cargoes with a flashpoint below 60°C, flammable and or toxic cargoes.
- Ventilation of the tank should continue throughout the tank washing operation to facilitate removal of cargo vapour.
- After carrying out water washing the tanks must be dried completely prior to the loading of water miscible cargoes (see Cargo Notes 1 and 4). Residual water/slops can be more aggressive than the original cargo.
- In certain cases it may be necessary to introduce dehumidified air into the tank in order to assist with the removal of water by venting.
- Washing must be carried out using saline seawater and, if necessary, final rinsing may be carried out using fresh or de-ionised water.

(ii) Although washing water temperatures and pressures may be as high as 85°C and 10kg/cm² it is recommended that the lowest acceptable temperatures and pressures are used. The cleaning of tanks that have carried inhibited cargoes such as styrene monomer, vinyl acetate monomer etc should be carried out using cold water to minimise the likelihood of polymerisation of any cargo absorbed in the coating.

Steam cleaning of coated tanks is acceptable, but it should be noted that steam cleaning at excessively high temperatures and for prolonged periods can cause damage to the tank coating.

(iii) Alkaline based tank cleaning compounds (pH >10) must not be used with Interline® 104, Interline® 344 and Interline® 605

(iv) Acid based tank cleaning compounds (pH < 5.5) must not be used with Interline® 104, Interline® 344 and Interline® 605

International Paint should be consulted regarding the acceptability of specific proprietary tank cleaning products.

(I) HIGH TEMPERATURE CARGOES

Care must be taken when loading high temperature cargoes. Where large temperature differentials exist between the cargo and tank there is a danger of the tank coating system being adversely affected due to thermal shock. If temperature differences are in excess of 55°C, it is recommended that loading is carried out at a controlled rate, initially slowly, to allow a gradual build up of temperature within the tank.

(J) CURING OF TANK COATING SYSTEMS

In order to ensure maximum resistance properties, all tank coating systems must be cured under good conditions. Curing is a complex process involving both release of solvent and chemical reaction. It is particularly sensitive to both substrate temperature and ventilation rate. The time/temperature relationships for cure and chemical resistance, which are given in the International Paint product data sheets and application procedures, assume a high level of vigorous ventilation.

International Paint should be consulted regarding detailed requirements for ventilation, cure times and temperatures.

It should be noted that failure to observe the specified curing conditions prior to cargo immersion may have a permanent adverse affect on the resistance properties of the coating.

With the exception of Interline® 9001, Interline® 994 and Interline® 994LT, the systems itemised in this Cargo Resistance Guide do not require heat post curing for maximum chemical resistance. However the carriage of an innocuous cargo such as a lube oil or low acid value vegetable oil, at an elevated temperature of 50°C, will assist in “maturing” of all organic (i.e. non-zinc) tank coating systems, prior to the carriage of more aggressive cargoes.

Interline® 9001

For Interline® 9001 post cure is mandatory prior to carriage of any cargoes. This may be achieved by a number of methods - see a) and b) below.

a) Hot Seawater/Fresh Water Immersion

A hot cure may be achieved by filling the cargo tank with hot seawater or hot freshwater. Where possible, it is recommended that this be carried out during sea-trials. Tanks should be filled to maximum capacity with no ullage space in order to post cure the entire tank, including the deck head.

Post cure duration will depend on the temperature of the coating as measured by the temperature of the water in the tank.

Measured Water Temperature	Minimum Time
60ºC	16 hours
70ºC	6 hours
80°C	3 hours

Note: Post curing by this method is suitable for double-hulled vessels only.

b) Hot Seawater/Freshwater Curing Using Tank Cleaning Machines

A hot cure may also be achieved by a hot recirculating wash with seawater/freshwater. Where possible, it is recommended that this again be carried out during sea-trials in accordance with the application guidelines cure times.

Post cure duration will depend on the temperature of the coating as measured by the temperature of the tank surfaces in adjacent spaces.

Minimum Surface Temperature	Minimum Time
60ºC	16 hours
70ºC	6 hours
80ºC	3 hours

It is recommended that, prior to tank washing, the water is heated using heating coils in slop tanks or by other suitable heating equipment. Once the water has reached 80 - 85ºC, it should then be recirculated through tank cleaning machines continuously for the minimum time period outlined in the above table, after the requisite substrate temperature has been reached.

The time taken to achieve the required steel temperature will depend on the capacity of heating equipment and external temperatures.

Records of the steel temperature are to be maintained at all times to ensure that the entire coated surface has attained the required minimum specified temperature/time requirements. It is recommended that thermocouples attached to suitable data loggers are placed around the tank (e.g. on reverse bulkheads in the double-hull space) in order to record the steel temperatures throughout the complete post-curing process.

Note: Post curing by this method is suitable for double-hulled vessels only.

Interline® 994 and Interline® 994LT

For carriage of very aggressive cargoes (i.e. those with ✓20 notation), heated post cure of Interline® 994 and Interline® 994LT is mandatory. This may be achieved by a number of methods - see a) and b) below.

For the carriage of aggressive cargoes (i.e. those with a ✓21 notation), cure may be achieved by heated post curing (as for cargoes with ✓20 notation), or by carrying acceptable cargoes, other than those bearing a **"✓20",**or **"✓21"** notation, over a minimum period of 3 months. Where tanks have been in service for a period of 3 months, but have not carried cargoes throughout that time, International Paint should be consulted regarding the carriage of particular cargoes.

a) Hot Seawater Curing Using Tank Cleaning Machines

Where possible, it is recommended that post curing by this method is carried out either during sea-trials, during seawater testing of the tanks or immediately after delivery of a vessel from a newbuilding or repair shipyard.

The required procedure is as follows:

- Seawater temperature: 80 - 85°C
- The minimum steel temperature of the internal surface must be 60°C.
- Minimum curing time is related to steel temperatures of 60ºC and above:

Minimum Steel Temperature	Minimum Time
60ºC	16 hours
70ºC	6 hours
80ºC	3 hours

Seawater at a temperature of 80 - 85ºC should be recirculated through tank cleaning machines continuously, for the minimum time periods as outlined in the above table, after the required steel temperature has been reached.

The time taken to achieve the required steel temperature will depend on the capacity of heating equipment and external temperatures.

Areas adjacent to a cargo tank undergoing post-curing must be empty or contain a cargo at a temperature of 60°C or higher.

Records of the steel temperature are to be maintained at all times to ensure that the entire coated surface has attained the required minimum specified temperature/time requirements. It is recommended that thermocouples attached to suitable data loggers are placed around the tank (e.g. on reverse bulkheads in the double-hull space) in order to record the steel temperatures throughout the complete post-curing process.

Note: Post curing by this method is suitable for double-hulled vessels only.

b) Carriage of Hot Cargo

Once the vessel enters service, post cure may also be achieved by carriage of a hot innocuous cargo such as lubricating oil, mineral or low acid value vegetable oil. The cargo must be carried in full tanks according to the following conditions:

Cargo Temperature	Minimum Carriage Time
50ºC	10 days
60ºC	5 days

Where possible, it is recommended that post-curing be carried out as soon as possible after the coating application, in accordance with the 'coating application guidelines' cure times.

If post-curing is carried out by this method, it is recommended that the integral tank thermometers are used to monitor and record temperature.

Areas adjacent to a cargo tank undergoing post-curing must be empty or contain a cargo at the same temperature (or higher) as the cargo used for post curing (see above).

Note: Post curing by this method is suitable for double-hulled vessels only.

(K) CARGO SAMPLES

Samples of all aggressive cargoes, bearing the cargo notation ✓11, ✓19, ✓20, ✓21 and ✓24, must be taken immediately prior to loading and unloading. These must be sealed, dated, properly labeled and retained for a minimum period of six months after unloading. A minimum sample size of 250ml should be taken.

(L) INTERLINE® 9001 PRECONDITIONING / FIRST CARGO

If a tank coated with Interline® 9001 is to carry methyl alcohol at any point during its service life, it must be preconditioned. This can **ONLY** be achieved by the carriage of any non-aqueous ✓ cargo (from the unrestricted category) for 14 days as first cargo.

(M) INTERLINE RENEW

For cargo tanks repaired with Interline Renew, continue to follow the cargo resistance guide of the repaired coating. Note that Interline Renew may need to be reapplied after carrying dimethylformamide. Improved performance can be expected following post cure for aniline, chloroform, dimethylformamide, ethylene dichloride and trichloroethylene.

Post curing should not commence until the relevant minimum time to service entry period has been observed from application of the final coat, and where required can be carried out at any point thereafter in the lifetime of the coating. Interline Renew can be post cured via one of the following methods:

- Recirculation of hot water (e.g. via tank cleaning operations)
- Hot fresh or sea water immersion
- Carriage of a hot innocuous cargo

Postcure via recirculating wash or hot water immersion

Interline Renew can be post cured by hot fresh or sea water immersion or by recirculating hot water, whether this be through tank cleaning operations or otherwise. Post curing repaired spots via hot water immersion and hot water recirculation should be carried out according to the following conditions:

Measured Water Temperature	Minimum Time
60°C	16 hours
70°C	6 hours
80°C	3 hours

Postcure via carriage of hot innocuous cargo

Interline Renew can be post cured by carriage of a hot innocuous cargo such as lubricating oil, mineral oil or low acid value vegetable oil. Cargoes intended for human consumption (e.g. food grade vegetable oils and potable water) should not be used for post cure. The cargo must immerse the repaired spots according to the following conditions:

Cargo Temperature	Carriage Time
50°C	10 days
60°C	5 days

Consult Interline Renew Application Guidelines and your International Paint Representative for further details.

SPECIFIC NOTES

Notation	Definition & Explanation (Click link for details)
1.	WATER MISCIBLE CARGOES
2.	VEGETABLE AND ANIMAL OILS AND FATS
3.	CAUSTIC CARGOES
4.	HYDROLYSABLE PRODUCTS
5.	CARGO CONTAMINATION
6.	CRUDE OIL AND DERIVATIVES
7.	AMINES
8.	WATER
9.	ACID AND ALKALINE CARGOES
10.	MOLASSES
11.	AGGRESSIVE CARGOES: INTERLINE® 904 – Minimum in service requirement
12.	CARGOES WHERE MORE INFORMATION REQUIRED
16.	PETROL / GASOLINE AND ALCOHOL MIXTURES
19.	AGGRESSIVE CARGOES: INTERLINE® 944, INTERLINE® 604, INTERLINE® 704 INTERLINE® 104, INTERLINE® 344 AND INTERLINE® 605 – Minimum in service requirement
20.	VERY AGGRESSIVE CARGOES: INTERLINE® 994/994LT – Mandatory heated post-cure requirements
21.	AGGRESSIVE CARGOES: INTERLINE® 994/994LT – Minimum in service period or heated post-cure required
22.	FREE AMMONIA CONTENT
23.	SOLUTIONS
24.	AGGRESSIVE CARGOES: INTERLINE® 9001

1. WATER MISCIBLE CARGOES

These must only be carried in perfectly dry tanks and water must be excluded during carriage.

They must not be preceded or followed by ballast water or any other aqueous cargo.

Venting of the tank must be carried out after unloading of the cargo to a “gas free condition” to ensure removal of as much cargo as possible, which may have been absorbed into the coating system. This must be done prior to any tank washing procedures being carried out. Ventilation should also continue during tank washing operations.
Any water residues left in the tank after washing must be removed immediately and drying completed by venting.

See General Note H for further details on tank cleaning.

2. VEGETABLE AND ANIMAL OILS AND FATS

(i) Interline® 944, Interline® 604 and Interline® 704

The free fatty acid (FFA) content of oils and fats must not exceed the value shown below.

If the period of carriage is prolonged, and the FFA content is close to the maximum permitted, it is recommended that heating is restricted to loading and unloading only.

When oils and fats are contaminated with water they become much more aggressive due to an increase in FFA content. For this reason, the moisture and insolubles/impurities content should not exceed 1.0%.

Product	Guide Notation	Max Free Fatty Acid
Interline® 704	✓2**	10%
Interline® 604	✓2**	10%
Interline® 944	✓2* or ✓2**	2.5% or 10% subject to cargo

(ii) Interline® 104 , Interline® 344 and Interline® 605

Interline® 104, Interline® 344 and Interline® 605 will resist these cargoes if their free fatty acid content does not exceed 2.5% and the product is dry and not overheated in transit. However, in order to minimize any danger of zinc pick-up within the cargo it is recommended that the free fatty acid content does not exceed 1%

Product	Guide Notation	Max Free Fatty Acid
Interline® 104	✓2*	2.5%
Interline® 344	✓2*	2.5%
Interline® 605	✓2*	2.5%

Moisture content max 0.25%,
Moisture and insolubles/impurities content max 1%.

(iii) Interline® 904, Interline® 994, Interline® 994LT and Interline® 9001

Vegetable and animal oils and fats may be carried in Interline® 904, Interline® 994, Interline® 994LT and Interline® 9001 coated tanks irrespective of free fatty acid content.

- All oils and fats must be free of any mineral acid.
- Maximum acceptable moisture and insolubles/impurities content is 1%.

Carriage Temperature:

Product	Max carriage temperature unless otherwise stated (°C)
Interline® 904	50
Interline® 994/994LT	60
Interline® 9001	60

- For highly viscous vegetable and animal oils and fats, maximum carriage temperatures are indicated in degrees centigrade. Where a maximum temperature is specified against a cargo this is a carriage temperature which should not be exceeded.

- However, for animal and vegetable oils with free fatty acid content in excess of 50%, the temperature of 50°C must not be exceeded unless a higher maximum temperature is specified against that particular cargo.

Loading and Unloading:

- Loading and unloading may be carried out at a temperature of up to 10°C higher than the specified maximum carriage temperature. The time at the higher temperature should be kept as short as possible and in any case must not exceed 48 hours. For Interline® 994, Interline® 994LT and Interline® 9001 this can be extended to 5 days. Consideration must be given to the effect on the cargo quality that this extended period at high temperature may have.

Carriage or loading/unloading at higher temperatures may be acceptable depending on the chemical composition of the cargo involved. International Paint should be consulted when carriage/handling at higher temperatures than those indicated is required.

Please note that recommendations regarding acceptable carriage/discharge temperatures are provided based on a review of the chemical resistance of the coating to carriage of the cargo. Consideration is not given to the effect of high temperature carriage on the quality of the cargo. International recommend that FOSFA guidance is consulted in this regard.

3. CAUSTIC CARGOES

Dilute caustic solutions can be very aggressive towards tank coatings.

Tanks must be cleaned thoroughly after carriage of caustic cargoes. Dilute residues must not be left in the tank after cleaning has been completed. The pH of the final rinse water must be in the range 6.8 – 7.2.

The following detailed notations should be used where appropriate:

Sodium Hydroxide Solutions

Concentration	Interline® 9001	Interline® 994/994LT	Interline® 904	Interline® 704	Interline® 944
75%	✓ 85ºC	✓ 85ºC	✓11A 50ºC 60 days	✓	✓
50%	✓ 50ºC	✓ 50ºC	✓11A 50ºC 60 days	✓	✓
40%	✓ 50ºC	✓ 50ºC	✓11A 50ºC 60 days	✓	✓
25%	✓ 35ºC	✓ 35ºC	×	✓	×
20%	✓ 35ºC	✓ 35ºC	×	×	×

Concentration	Interline® 604	Intershield® 300/300V	Interline® 644
75%	✓	NT	✓
50%	✓	NT	✓
40%	✓	NT	✓

Potassium Hydroxide Solutions

Concentration	Interline® 9001	Interline® 994/994LT	Interline® 904	Interline® 704	Interline® 944
75%	✓ 50ºC	✓ 50ºC	×	✓	✓
50%	✓ 50ºC	✓ 50ºC	×	✓	✓
40%	×	×	×	✓	✓

Concentration	Interline® 604	Intershield® 300/300V	Interline® 644
75%	×	NT	NT
50%	×	NT	NT
40%	×	NT	NT

4. HYDROLYSABLE PRODUCTS

These cargoes are susceptible to hydrolysis in the presence of water to form acidic compounds which are potentially damaging to the coating.

These cargoes are only acceptable if they are pure, essentially neutral and are carried under completely dry conditions.

Moisture content must not exceed 200 ppm.

These cargoes must only be carried in perfectly dry tanks and must not be preceded or followed by ballast water or any other aqueous cargo.

Interline® 9001: Only for those cargo which also have a ✓24 notation, it is possible to carry an aqueous cargo, or ballast water as the next cargo, if a minimum 10 day ventilation period is applied in between.

Venting of the tank must be carried out after cargo unloading to a “gas free condition” to ensure removal of as much cargo as possible, which may have been absorbed into the coating system. This must be done prior to any tank washing procedures being carried out. Ventilation should also continue during tank washing operations.

Any residues left in the tank after washing must be removed immediately and drying completed by venting.

See General Note H for further details on tank cleaning.

5. CARGO CONTAMINATION

(i) Interline® 944, Interline® 604, Interline® 704, Interline® 904, Interline® 994, Interline® 994LT, Interline® 9001 and Intershield® 300/300V

See general notes – Section (E)

(ii) Interline® 104, Interline® 344 and Interline® 605

Zinc silicate may present “zinc” pick up problems (metallic zinc) and care is necessary with some cargoes, in particular foodstuffs and aviation fuels. Contamination due to traces of previous cargo can only be avoided by thorough tank cleaning between cargoes. It is also advisable to thoroughly wash (and dry) the complete tank using the tank washing system before loading of first cargoes into newly coated tanks.

6. CRUDE OILS AND DERIVATIVES

Acid sour crudes and their derivatives slowly degrade zinc silicate coatings. For maximum coating life crude oils with hydrogen sulphide levels in excess of 300 ppm and high neutralization numbers, i.e. greater than 0.3, should not be carried.

7. AMINES

Epoxy coatings are resistant to very few amines. Interline® 104, Interline® 344 and Interline® 605 zinc silicate coatings will resist a much larger number of this class of cargo but only if the cargo is pure, completely free from water, and remains free from water contamination during transit.

8. WATER

Interline® 104, Interline® 344 and Interline® 605 provide excellent anticorrosive protection for prolonged periods. Zinc silicates, however, are not considered suitable for continuous immersion as would be experienced in a ballast tank.

9. ACID AND ALKALINE CARGOES

Zinc silicate coatings are not suitable for the carriage of strongly acid or alkaline cargoes. To ensure maximum coating life with Interline® 104, Interline® 344 and Interline® 605, cargoes carried must only be within the pH range 5.5 – 10.0.

10. MOLASSES

Dilute solutions of molasses, produced during tank cleaning operations, may ferment leading to the formation of acids. In order to prevent coating attack these residues must be diluted to a neutral pH (6.8 – 7.2) and removed from the tank within 24 hours.

11. AGGRESSIVE CARGOES: INTERLINE® 904

Prior to carriage of these cargoes, the coating must have been in service for a minimum period of three months carrying acceptable cargoes other than those bearing a "✓11", notation. Where tanks have been in service for a period of 3 months, but have not carried cargoes throughout that time, International Paint should be consulted regarding the carriage of particular cargoes.

The period of continuous carriage must not exceed that shown in the cargo resistance guide.

After discharge, the coating must be allowed to recover fully. This must be achieved by the carriage of a cargo from the unrestricted category, for the minimum period as indicated in the table below. Carriage of a hot (50°C) innocuous lube oil, mineral oil or low acid value vegetable oil is particularly recommended during the "recovery" period.

The minimum recovery period relates to the actual notation, 11A, 11B or 11C

	Minimum "Recovery" Period	Permitted Cargoes During "Recovery" Period
A	10 Days	Any acceptable except those with "✓**11"** notation
B	10 Days	Any acceptable non-aqueous except those with "✓**11"** notation
C	30 Days	Any acceptable non-aqueous except those with "✓**11"** notation

12. CARGOES WHERE MORE INFORMATION REQUIRED

Most cargoes within this classification can be carried. However, some cargoes are carried under generic names which give insufficient information to enable specific recommendations to be made.

In these cases a detailed specification for the cargo must be supplied to International Paint; a recommendation on the cargo notation can usually be made without testing.

In some cases testing may be required. International Paint offers a testing service where cargoes can be tested at the request of a ship operator. In consultation with the ship operator, International Paint will carry out relevant testing and advise on the results obtained.

16. PETROL / GASOLINE AND ALCOHOL MIXTURES

Petrols/gasolines can vary in composition and the addition of aromatic and/or oxygenated solvents/chemicals is common. Many contain an addition of an alcohol, or combination of alcohols. The main concern is the presence of methanol which has sometimes been added to unleaded petrols/gasolines and can cause damage to the coating.

Ethanol and other higher molecular weight alcohols are acceptable at any level of addition for all coatings.

(i) Interline® 944, Interline® 644, Interline® 604, Intershield® 300 and Intershield® 300V

Methanol is not allowed at any level in petrol/gasoline cargoes carried in tanks coated with the above coatings.

(ii) <u>Interline® 704, Interline® 904, Interline® 994, Interline® 994LT, Interline® 9001, Interline® 104 , Interline® 344 and Interline® 605.</u>

Methanol is permitted as follows. Where methanol impurities are present, additional guidance notes apply as captured below.

Coating	Methanol Level	Applicable notations when methanol impurities present
Interline 704	0 – 5%	**✓1, ✓19**
Interline 904	0 – 5%	**✓1, ✓19**
Interline 994/994LT	0 – 20%	**✓1, ✓21B**
Interline 994/994LT	20 – 100%	**✓1, ✓21B**
Interline 9001	Any level	**✓24**
Interline 104/344/605	Any level	✓

19. AGGRESSIVE CARGOES: INTERLINE® 944, INTERLINE® 604, INTERLINE® 704 INTERLINE® 104, INTERLINE® 344 AND INTERLINE® 605

Prior to carriage of these cargoes, the coating must have been in service for a minimum period of three months carrying acceptable cargoes other than those bearing a "**✓19**" notation. Where tanks have been in service for a period of 3 months, but have not carried cargoes throughout that time, International Paint should be consulted regarding the carriage of particular cargoes.

With Interline® 104, Interline® 344 and Interline® 605 there is no restriction on carriage time after the initial three month service period

For Interline® 944, Interline® 604 and Interline® 704 the period of continuous carriage should not exceed 30 days and must be followed by the carriage of acceptable non-aqueous cargoes other than those bearing a "**✓19**" notation for at least 10 days.

20. VERY AGGRESSIVE CARGOES: INTERLINE® 994/994LT

Prior to carriage of these cargoes in Interline® 994 and Interline® 994LT coated tanks, <u>heated post-curing</u> must be carried out, either by:

- carriage of hot innocuous cargo

or

- recirculating wash using hot seawater

For full details of post-curing procedures, see General Note J.
The period of continuous carriage must not exceed that shown in the cargo resistance guide.

After unloading, the coating must be allowed to recover fully. This must be achieved by the carriage of a cargo from the unrestricted category (i.e. those bearing a "✓" notation), for the minimum period as indicated in the table below. Carriage of a hot (up to 60°C) innocuous lube oil, mineral oil or low acid value vegetable oil is particularly recommended during the "recovery" period.

The minimum recovery period relates to the actual notation 20A, 20B or 20C.

	Minimum "Recovery" Period	Permitted Cargoes During "Recovery" Period
A	10 Days	Any acceptable except those with **"✓20",**or **"✓21"** notation
B	10 Days	Any acceptable non-aqueous except those with **"✓20",**or **"✓21"** notation
C	30 Days	Any acceptable non-aqueous except those with**"✓20",**or **"✓21"** notation
D	10 Days (30 Days before methyl alcohol)	Any acceptable non-aqueous except those with"✓20",or "✓21" notation

21. AGGRESSIVE CARGOES: INTERLINE® 994/994LT

These cargoes may only be carried after the coating has carried acceptable cargoes, other than those with **"✓20",**or **"✓21"** notation, for a minimum period of 3 months, or if it has been post heat cured to accept "✓20**"** notation cargoes. Where tanks have been in service for a period of 3 months, but have not carried cargoes throughout that time, International Paint should be consulted regarding the carriage of particular cargoes.

For full details of post-curing procedures, see General Note J.

The period of continuous carriage must not exceed that shown in the cargo resistance guide.

After unloading, the coating must be allowed to recover fully. This must be achieved by the carriage of a cargo from the unrestricted category, for the minimum period as indicated in the table below. Carriage of a hot (50°C) innocuous lube oil, mineral oil or low acid value vegetable oil is particularly recommended during the "recovery" period.

The minimum recovery period relates to the actual notation, 21A, 21B or 21C

	Minimum "Recovery" Period	Permitted Cargoes During "Recovery" Period
A	10 Days	Any acceptable except those with **"✓20",**or **"✓21"** notation
B	10 Days	Any acceptable non-aqueous except those with **"✓20",**or **"✓21"** notation
C	30 Days	Any acceptable non-aqueous except those with **"✓20",**or **"✓21"** notation

22. FREE AMMONIA CONTENT

Cargoes bearing this notation may be carried, provided the maximum free ammonia content is 1%.

Typical free ammonia levels are <1000ppm in practice, however it is recommended that free ammonia levels are confirmed prior to loading of cargo to ensure that the parcel meets the above requirement of <1%.

23. SOLUTIONS

Provided the cargo is a solution in water only, the cargo may be carried (subject to restrictions from other notations in the CRG).
If the cargo is a solution in anything other than water, please consult International Paint for advice.

24. AGGRESSIVE CARGOES: INTERLINE® 9001

Methyl Alcohol Carriage

If a **tank coated with Interline® 9001 is to carry methyl alcohol at any point during its service life, it must be preconditioned. This can ONLY be achieved by the carriage of any non-aqueous ✓ cargo (from the unrestricted category) for 14 days as first cargo. See General Note L**

Carriage of all "✓24" notation cargoes (including methyl alcohol)

These must only be carried in perfectly dry tanks and water must be excluded during carriage.

Aqueous cargoes or ballast water must not be carried in the tank during the 10 days prior to carriage of a "✓24" notation cargo

The period of continuous carriage must not exceed that shown in the cargo resistance guide.

After unloading these cargoes, the coating must be allowed to recover fully. This must be achieved by either ventilation or the carriage of a non-aqueous cargo except those with "✓**24**" notation.

Minimum "Recovery" Period	Permitted Cargoes During "Recovery Period
10 Days	• Any acceptable non-aqueous cargo, except those with "✓ 24" • Ventilation

Carriage of a hot (50ºC) innocuous lube oil, mineral oil or low acid value vegetable oil is particularly recommended during the "recovery" period.

Venting of the tank must be carried out after unloading of the cargo to a "gas free condition" to ensure removal of as much cargo as possible, which may have been absorbed into the coating system. This must be done prior to any tank washing procedures being carried out. Ventilation should also continue during tank washing operations.
Any water residues left in the tank after washing must be removed immediately and drying completed by venting.

See General Note H for further details on tank cleaning.

Methyl Alcohol – Sodium Hydroxide Sequencing

Carriage of Sodium Hydroxide prior to or following the carriage of methyl alcohol is approved with the following constraints:

- Sodium Hydroxide solution must be a minimum concentration of 50% (wt/wt).
- The maximum duration of a single methyl alcohol carriage is 45 days.
- A single [methyl alcohol - sodium hydroxide - methyl alcohol] sequence is permitted, provided that the duration of sodium hydroxide carriage is a minimum of 10 days.
    - ✓ Where the sodium hydroxide carriage period does not meet or exceed the required 10 days. A recovery period is required prior to the subsequent carriage of methyl alcohol.
- Following the single methyl alcohol - sodium hydroxide - methyl alcohol carriage sequence, a 10 day recovery period is required via the carriage of a non-aqueous ✓notation cargo or ventilation for a minimum of 10 days to allow the coating to recover.

Important Notes

All representations and statements made in this Cargo Resistance Guide are accurate to the best of our knowledge at the time of publication. The Cargo Resistance Guide may be updated from time to time in line with our policy of continuous improvement and made available on the website www.International-marine.com which should be checked regularly by users.

Failure to comply with the requirements of the version of this Cargo Resistance Guide that is current at the time at which cargo is loaded onto a particular vessel will invalidate any guarantee given by International Paint for the coating system as applied to that vessel.

Subject to the above, all products supplied and technical advice given are subject to International Paint's standard conditions of sale.

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