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Design and construction

Anti - Corrosion System Notations

Linked Supporting Service

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**Lloyd's Register Marine
Business Stream**

71 Fenchurch Street
London
EC3M 4BS
Telephone 020 7709 9166
Telex 888379 LR LON G
Fax 020 7488 4796

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ShipRight Anti-Corrosion System Notations

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1. General

Corrosion is one of the major problems affecting the safe operation, maintenance and ultimately the service life of a ship. Owing to the corrosive nature of the marine environment and the corrosive media/cargoes carried, corrosion can manifest itself in many forms and in various locations in the ship structure. Different measures can be taken to mitigate corrosion and to protect ship structural integrity including:

- application of coatings;
- cathodic protection;
- good structural design;
- careful selection of materials; and
- good corrosion management during ship operation.

Coating application and cathodic protection systems are the main corrosion prevention methods used for ship structures.

This procedure sets out mandatory requirements for the protective coating of dedicated water ballast tanks and double side skin spaces (DSS). When the requirements are complied with, Class notations will be assigned to the ship to record the standard of corrosion prevention system applied.

In addition to the provision of high quality corrosion prevention systems at the new construction stage, it is important that corrosion is managed throughout the service life of a ship through regular survey and maintenance.

2. Notations

2.1 ShipRight ACS

The **Anti-Corrosion System** Notation, ShipRight ACS (...), will be assigned when a ship complies with the requirements of this procedure. The Notation will be placed in Column 4 of the Register book. Requirements for application of the procedure are given in Section 3.

Contained within the brackets of ShipRight ACS (...) are letters representing mandatory notation items; for example, **B** represents coating of water ballast tanks and **D** represents coating of double side skin spaces.

If at survey a mandatory notation item is found no longer to comply with the requirements, repairs must be carried out to ensure that the requirements are once again satisfied.

2.2 ShipRight ACS Notation for water ballast tanks and double side skin spaces

ShipRight ACS (B) will be assigned to all ship types where approved coating systems, compliant with this procedure, are applied to all dedicated sea water ballast tanks.

ShipRight ACS (B, D) will be assigned to bulk carriers where approved coating systems, compliant with this procedure, are applied to all seawater ballast tanks and to the double-side skin spaces.

2.3 ShipRight PCWBT Descriptive Note

The existing Descriptive Note ShipRight PCWBT (Date), (see Ref 2), is optional and remains applicable to ships which are not covered by the application requirements of ShipRight ACS (see Section 3).

3. Application

This procedure and the ACS Notation are mandatory for ships of 500 gross tonnes and above where:

- the building contract is placed on or after 1 July 2008; or
- in the absence of a contract, the keel is laid on or after 1 January 2009; or
- the delivery date is on or after 1 July 2012.

This procedure also applies as follows to ships approved in accordance with the Common Structure Rules (CRS) and contracted on or after 8 December 2006:

- ballast tanks of double hull oil tankers of length greater than or equal to 150 m and
- ballast tanks of bulk carriers of length greater than or equal to 90 m,
- double side skin spaces of bulk carriers of length greater than or equal to 150 m.

At the request of an owner, the Notation may also be assigned to a ship which is outside the scope of the above providing the requirements of this procedure are complied with in full.

4. Requirements

4.1 General

To qualify for the ACS Notation, the following is required:

- submission of a coating specification agreed by the shipyard, the ship owner and the paint manufacturer, including the coating system selection, surface preparation and coating application and inspection procedure;
- all coating products are to be type approved by Lloyd's Register;
- inspection of surface preparation and coating application is to be carried out by Lloyd's Register recognised coating inspectors and verified by Lloyd's Register surveyors;
- a coating technical file (CTF) is to be compiled by the shipyard and submitted to Lloyd's Register for auditing before ship delivery.

The CTF is to be submitted to Lloyd's Register for review upon completion of the ship construction phase and prior to ship delivery. The CTF is to include coating specifications, coating product technical data sheet and safety data sheet, inspection schedule and inspection reports.

Sections 4.2 to 4.5 give the requirements for coating specification, coating application and coating inspection for water ballast tanks and double side skin spaces. General coating application requirements and coating procedure survey/auditing are detailed in Ref 1.

4.2 Coating selection

Paint products of a coating system for water ballast tanks and DSS are to be type approved by Lloyd's Register (see list of Lloyd's Register approved PSPC compliant coatings on CDLive).

The paints of the main coating system are to be epoxy based products or approved alternative coating systems.

Prefabrication primers are to be compatible with the main coating system; otherwise, the shop primer coat must be removed by blasting to at least 70% during secondary surface preparation.

Where high temperature or erosion is expected, special consideration is to be given in product selection and specification and the details are to be recorded in the CTF.

If sacrificial anodes are installed in water ballast tanks, drawings of and calculations for the cathodic protection system are to be submitted to Lloyd's Register for review.

4.3 Surface preparation and coating application

This section gives brief details of requirements for steel surface preparation and coating application. Full details are given in Ref 1.

4.3.1 Primary surface preparation

Steel plates are to be inspected for rust levels in accordance with ISO 8501-1 prior to shop blasting. The rust levels are not to be greater than grade B. Any surface defects found, such as laminations, are to be treated prior to the application of shop primer.

All oil and grease is to be removed from the surface using suitable methods prior to blasting. Prefabrication primer application must not be carried out if:

- the surface temperature of the steel is less than 3°C above the dew point
- the relative humidity is above 85%

The total soluble salt content (equivalent to NaCl) on blasted steel surfaces is not to be greater than 50 mg/m² in accordance with ISO 8502-9.

Surface cleanliness and surface profile are to be checked after blasting and are to be Sa2½ and medium (30-75 µm) in accordance with ISO 8501-1 and ISO 8503, respectively.

For automatic primer application shops, an approved quality control system must be in place and is to be periodically audited (see Ref 3).

4.3.2 Secondary surface preparation (Block stage)

At the block stage, steel is to be treated to P2 in accordance with ISO 8501-3. Edges are to be rounded off with three passes of grinding or to a 2 mm radius.

All oil and grease is to be removed from the surface with suitable solvents/detergents prior to blast cleaning.

Areas with damaged or rust stained shop primer are to be treated to Sa2½. Other areas with intact approved shop primer are to be treated by sweep blasting or are to be high pressure washed to remove surface contamination. Areas which are difficult to blast are to be treated to St3.

Shop primer not approved to be compatible with the top coating is to be removed to at least 70%.

Before coating application, surface salt and dust levels are to be checked. The total water soluble salt level (equivalent to NaCl) is not to exceed 50 mg/m² in accordance with ISO 8502-9.

The dust quantity rating is not to exceed quantity rating of 1 for dust size classes "3", "4" or "5" (ISO 8502-3). Dust of lower size classes is to be removed if visible on the surface without magnification.

4.3.3 Coating application

Coating application is not to be carried out if:

- the surface temperature of the steel is less than 3°C above the dew point, or
- the relative humidity is above 85%, or
- there is any possibility that the surface is wet.

Adequate ventilation is to be provided during and after coating application to enable proper drying and curing in accordance with the manufacturer's instructions.

Paint is to be mixed and applied within the temperature range specified in the product technical datasheet and is to be used within the stated pot-life.

Thinners are not to be used unless the paint manufacturer instructs so and recommends specific thinner products and appropriate ratios.

Two stripe coats are to be applied by brush or roller to all edges, welds, corners, scallops and areas where a required coating thickness would be difficult to achieve by spraying alone. The second stripe coat on automatic weld seams may be omitted subject to the coating inspector's approval.

The time required between application of the two coats is to be as recommended by the paint manufacturer in order to achieve good adhesion and curing.

Any surface contamination such as rust, salt, grease and abrasives is to be avoided and, if found, must be removed prior to the application of the next coat.

Dry Film Thickness (DFT) readings are to be taken after the final coat. Any deficiencies are to be corrected.

4.3.4 Surface preparation and coating after erection

Areas in way of joints are to be treated to St3 or Sa2½ where practicable.

Small areas of coating damage (total damage area up to 2% of the total area of a tank) are to be treated to St3. If coating damage is contiguous and is over 25 m² or the total of small damaged areas is over 2% of the total area of a tank, Sa2½ shall apply. Small coating damages which do not reach the steel substrate may be sanded and repaired.

Surfaces of join-up areas or weld joints intentionally left uncoated for subsequent welding or hydrotesting are not considered to be damaged areas.

Areas to be overlapped at the intact coating are to be feathered for good adhesion.

4.4 Inspection

Coating inspection is to be carried out by Lloyd's Register recognised coating inspectors and agreed by the shipyard, ship owner and paint manufacturer.

The inspection schedule for surface preparation and coating processes is to be agreed upon between the ship owner, shipyard and coating manufacturer and is to be reviewed by Lloyd's Register surveyors.

Inspection reports are to be submitted to Lloyd's Register for auditing.

4.5 Verification

Verification is to be carried out by Lloyd's Register surveyors and is to include document auditing and onsite attendance on a sampling basis.

The Product Technical Data Sheet and Statement of Compliance issued by the manufacturer are to be verified against the Lloyd's Register Type Approval Certificate.

The coating identification on representative containers is to be consistent with the coating system identified in the Technical Data Sheet and Type Approval Certificate.

Qualification of the coating inspector(s) is to be verified.

The Lloyd's Register surveyor will, on a sampling basis, verify that the inspector's reports on surface preparation and coating application comply with the shipyard's approved coating system application procedures.

On a sampling basis, Lloyd's Register surveyors will monitor that the coating inspectors are using the correct equipment, techniques and reporting methods.

Any deviations found are to be raised initially with the coating inspector who is then responsible for identifying and implementing the corrective actions.

The shipyard will be informed by Lloyd's Register of any corrective actions taken that are not acceptable to Lloyd's Register or have not been closed out.

A Class certificate will not to be issued until all required corrective actions have been closed out to the satisfaction of Lloyd's Register.

5. References

1. LR PSPC Verification Guidelines
2. ShipRight - Protective Coatings in Water Ballast Tanks
3. LR Ship Yard PSPC Auditing Guidelines