Anti-Corrosion System Notation

September 2014
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Notation</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>ACS Notation and Notation Characters</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Notation Applications</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Coating Requirements</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Coating Verification</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Corrosion Resistant Steel</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>References</td>
<td>7</td>
</tr>
</tbody>
</table>
ShipRight Anti-Corrosion System Notation

Section 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 a ship’s 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 and optional requirements for the anti-corrosion systems applied to protect different parts of the ship structures from corrosion. When the requirements are complied with, Class notations will be assigned to the ship to record the standard of an anti-corrosion system applied.

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

Section 2: ACS Notation and Notation Characters

2.1 ShipRight ACS Notation

The Anti-Corrosion System Notation, ShipRight ACS (…), will be assigned when a ship complies with the requirements of this procedure at the new construction stage. The notation will be placed in Column 4 of the Register book. The requirements and procedure for the applications are given in Section 3.

Contained within the brackets of ShipRight ACS (…) are associated characters representing mandatory or optional anti-corrosion systems; for example, ShipRight ACS (B) represents that an approved protective coating has been applied to water ballast tanks in compliance with this procedure.

During service, if at survey a mandatory notation item is found no longer complying with survey requirements, repairs must be carried out to ensure that the requirements are once again satisfied in accordance with relevant Rules and Regulations.

2.2 ShipRight ACS characters

The ShipRight ACS Notation with the following associated characters will be assigned to ships where the following anti-corrosion systems are installed in compliance with this procedure.
2.3 **ShipRight PCWBT Descriptive Note**

The Descriptive Note ShipRight PCWBT (Date), (see Reference 7.1), is mandatory and remains applicable to ships which are not covered by the application requirements of the ShipRight ACS Notation.

### Section 3: Notation Applications

#### 3.1 ShipRight ACS Notation character B – Protective coating system for water ballast tanks

ACS Notation character B is assigned to a ship when an approved protective coating system is applied to the seawater ballast tanks during new construction in compliance with this procedure.

Application of protective coating system for water ballast tanks is mandatory for ships to which SOLAS Chapter II-1 Regulation 3-2 is applicable and:

- 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.

The requirement also applies to ships approved in accordance with the Common Structural Rules 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.

#### 3.2 ShipRight ACS Notation character C – Protective coating system for cargo oil tanks of crude oil tankers

ACS Notation character C is assigned to a ship when an approved protective coating system is applied to the cargo oil tanks of crude oil tankers during new construction in compliance with this procedure.

Unless a Lloyd’s Register approved alternative corrosion protection system is used (see 3.3) this requirement is mandatory for crude oil tankers as defined in Annex I of MARPOL 73/78, where:

- the building contract is placed on or after 1 January 2013; or
- in the absence of a contract, the keel is laid on or after 1 July 2013; or
- the delivery date is on or after 1 January 2016.

#### 3.3 ShipRight ACS Notation character C* – Protection of cargo oil tanks of crude oil tankers using corrosion resistant steel

ACS Notation character C* is assigned to a ship when the cargo oil tanks of crude oil tankers are manufactured using corrosion resistant steel during new construction in compliance with this procedure.

As an alternative to 3.2, mandatory corrosion protection of the cargo oil tanks of crude oil tankers as defined in Annex I of MARPOL 73/78 may be achieved by the use of approved corrosion resistant steel, where:

- the building contract is placed on or after 1 January 2013; or
- in the absence of a contract, the keel is laid on or after 1 July 2013; or
- the delivery date is on or after 1 January 2016.

#### 3.4 ShipRight ACS Notation character D – Protective coating system for double-side skin spaces of bulk carriers

ACS Notation character D is assigned to a ship when an approved protective coating system is applied to the double-side skin spaces during new construction in compliance with this procedure.

The requirement is mandatory for new bulk carriers including dedicated ore carriers of length of 150 m or above within the scope of 3.1. For Common Structural Rules ships it applies to bulk carriers of length greater than or equal to 150 m.
3.5 **ShipRight ACS Notation character V – Protective coating systems for void spaces of bulk carriers and oil tankers**

ACS Notation character V is optional and is assigned to a ship when a protective coating system is applied to the void spaces of bulk carriers and oil tankers constructed in compliance with this procedure.

3.6 **Ship areas covered by ACS Notation characters**

The areas covered by the ACS Notation are listed in Table 1.

### Table 1  Applications of ACS Notation characters to ship types and areas

<table>
<thead>
<tr>
<th>ACS Notation characters</th>
<th>Ship type</th>
<th>Areas to be protected</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>All ships</td>
<td>All internal surfaces of dedicated seawater ballast tanks</td>
</tr>
</tbody>
</table>
| C                       | Crude oil tankers | The following areas of cargo oil tanks should be coated:  
  - Deckhead with complete internal structure, including brackets connecting to longitudinal and transverse bulkheads. In tanks with ring frame girder construction the underdeck transverse framing to be coated down to level of the first tripping bracket below the upper faceplate.  
  - Longitudinal and transverse bulkheads to be coated to the uppermost means of access level. The uppermost means of access and its supporting brackets to be fully coated.  
  - On cargo tank bulkheads without an uppermost means of access the coating to extend to 10 per cent of the tank height at the centreline but need not extend more than 3 m down from the deck.  
  - Flat inner bottom and all structure to height of 0.3 m above inner bottom to be coated. |
| C*                      | Crude oil tankers | The following areas of cargo oil tanks should be protected by the application of corrosion resistant steel during construction:  
  - Deckhead with complete internal structure, including brackets connecting to longitudinal and transverse bulkheads. In tanks with ring frame girder construction the underdeck transverse framing to be protected down to level of the first tripping bracket below the upper faceplate.  
  - Longitudinal and transverse bulkheads to be protected to the uppermost means of access level. The uppermost means of access and its supporting brackets to be protected.  
  - On cargo tank bulkheads without an uppermost means of access the protection is to extend to 10 per cent of the tank height at the centreline but need not extend more than 3 m down from the deck.  
  - Flat inner bottom and all structure to height of 0.3 m above inner bottom to be protected. |
| D                       | Bulk carriers | Double-side skin spaces |
| V                       | Bulk carriers and crude oil tankers | For bulk carriers:  
  - Double bottom pipe passages/pipe tunnels.  
  - Small void spaces located behind gusset or shedder plates at the bottom of corrugation bulkheads with exception of totally enclosed spaces.  
  - Other small void spaces in cargo spaces, with the exception of totally enclosed spaces.  
  - Lower transverse stool of transverse bulkheads, with the exception of totally enclosed spaces.  
  - Upper transverse stool of transverse bulkheads, with the exception of totally enclosed spaces.  
  - Forward cofferdam/cofferdam separating cargo from forecastle.  
  - Cofferdam in cargo area/cofferdam separating incompatible cargoes.  
  - Aft cofferdam.  
  - Duct keel/pipe tunnels.  
  - Lower bulkhead stools.  
  - Upper bulkhead stools.  

In addition to the areas specified in Table 1, access arrangements that are integral to the ship structure, such as stiffener depths for walkways, stringers, etc., are to fully comply with the relevant requirements for the notation.

Other means of access within the areas specified in Table 1 which are not integral parts of the structure such as rails, independent platforms, ladders, pipe supports and measurement devices, etc., should either be coated to the extent practicable or protected by other forms of corrosion protection.
Section 4: Coating Requirements

4.1 General

To qualify for the ACS Notation, the following requirement shall be complied with:

- 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 to Lloyd’s Register for review prior to construction;
- all coating products are to be approved by Lloyd’s Register;
- inspection of surface preparation and coating application is to be carried out by qualified 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 review before ship delivery. The CTF is to include the following information:
  - coating specifications
  - coating Approval Certificates and product technical data sheet
  - shipyard work record of coating application
  - inspection procedure and reports
  - in-service maintenance and repair procedure

The following sub-Sections give the requirements for coating specification, application and inspection for different areas of ship structures.

4.2 Coating selection

Paint products of a coating system are to be approved by Lloyd’s Register (see approval requirements and lists of Lloyd’s Register approved PSPC compliant coatings on Lloyd’s Register’s Class Direct website).

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

Prefabrication shop primers shall be approved by Lloyd’s Register for weldability. In addition, the shop primers are to be compatible with main coating systems; otherwise, the shop primer coat shall be removed by blasting to at least 70 per cent during secondary surface preparation.

Where exposure to elevated temperatures or erosion is expected, special consideration is to be given in coating 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.

4.2.1 Surface preparation and coating application

This Section gives brief details of requirements for steel surface preparation and coating application. Full details of requirements are given in Reference 7.2 and some reduced requirements for ACS Notation character V are given in 4.2.6.

4.2.2 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 such as laminations found 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. Application of the prefabrication primer must not 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 per cent; or
- the steel temperature is below that recommended by the paint manufacturer.

Surface cleanliness and surface profile are to be checked on completion of blast cleaning and are to be Sa2½ and medium (30-75 µm) in accordance with ISO 8501-1 and ISO 8503, respectively.

The total soluble salt level (equivalent to sodium chloride) on blasted steel surfaces is not to be greater than 50 mg/m² in accordance with ISO 8502-9 or approved equivalent methods according to NACE SP 0508-2010 Item No. 21134.

For automatic shop primer application lines, an approved quality control system must be in place and is to be periodically audited.

4.2.3 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.
ShipRight Anti-Corrosion System Notation

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. Small 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 by blasting to at least 70 per cent.

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

The dust quantity rating is not to exceed quantity rating 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.

4.2.4 Coating application

Coating application shall not 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 per cent, or
- the steel temperature is below that recommended by the paint manufacturer.

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 to all edges, welds, corners, scallops and areas where a required coating thickness would be difficult to achieve by spraying alone. Rollers can only be used for scallops and rat holes. The second stripe coat on automatic weld seams may be omitted subject to the coating inspector’s approval.

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.

The minimum and maximum over coating limits between coats are to be strictly adhered to in accordance with the paint manufacturer’s recommendations in order to achieve good inter-coat adhesion and curing.

Coating thickness should be controlled during coating applications and the total Dry Film Thickness (DFT) shall be measured after the final coat to meet the nominal DFT specified with 90/10 rule. The maximum DFT shall be below the value specified by the manufacturer. Any deficiencies are to be corrected.

<table>
<thead>
<tr>
<th>Table 2 Minimum requirements for ACS Notation character V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface preparation and coating stage</td>
</tr>
<tr>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Secondary preparation</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Main coating application (block and erection stages)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
4.2.5 Surface preparation and coating after erection

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

Small areas of coating damage (total damage area up to 2 per cent of the total area of a tank) may be treated to St3. If coating damage is contiguous and is over 25 m², or the total of small damaged areas is over 2 per cent 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.

For cargo oil tanks, the maximum allowable limits of total small area coating damage for St3 treatment are 20 per cent and 3 per cent of a coated tank for inner bottom and underdeck surfaces respectively. Damages over the above levels or contiguous damage over 25 m² shall be treated to Sa2½.

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

Prior to coating repair, the damaged areas shall be treated. Overlapped areas with the intact coating are to be feathered for good adhesion.

4.2.6 Reduced requirements for ACS Notation character V

While the other surface preparation and coating requirements remain the same as specified above, the following minimum requirements listed in Table 2 can only be acceptable for ACS Notation character V.

4.3 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 prior to construction.

Inspection reports that form part of CTF are to be submitted to Lloyd’s Register for auditing.

Section 5: Coating Verification

Verification is to be carried out by Lloyd’s Register Surveyors and is to include document auditing and on-site attendance on a sampling basis. Details of guidelines are found in Reference 7.2.

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

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

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

On a sampling basis, Lloyd’s Register Surveyors shall monitor that the coating inspectors are using the correct equipment, techniques and reporting methods.

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.

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 that are not acceptable to Lloyd’s Register, or have not been closed out.

A CTF in accordance with Section 4.1 is to be submitted to Lloyd’s Register for review prior to ship delivery.

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

Section 6: Corrosion Resistant Steel

6.1 General

To qualify for ACS Notation character C*, the following requirements shall be complied with:

- the corrosion resistant steels used are to be approved by Lloyd’s Register;
- the application of corrosion resistant steel is to be verified by Lloyd’s Register Surveyors;


ShipRight Anti-Corrosion System Notation

- a Technical File is to be compiled by the shipyard and submitted to Lloyd’s Register for review before ship delivery. The Technical File is to include the following information:
  - copies of the Approval Certificate(s);
  - details of the welding consumables and welding procedures used;
  - repair methods, if specified by manufacturer;
  - areas of application/location of corrosion resistant steel;
  - brand and grade of corrosion resistant steel, including location and thicknesses;
  - in-service maintenance and repair procedures.

Sections 6.2 and 6.3 give the requirements for material selection, application and verification for corrosion resistant steel.

6.2 Material selection

Only corrosion resistant steels approved by Lloyd’s Register shall be utilised, see Ch 3, 1.3 of the Rules for Materials. Approved manufacturers can be identified on Lloyd’s Register’s Class Direct website. Lloyd’s Register Approval Certificates indicate the acceptable locations of use, and any approved welding consumables.

In locations where additional corrosion protection is necessary, i.e.,:
  a) if two different grades of corrosion resistant steel are used together;
  b) if corrosion resistant steel and conventional steel are used together; or
  c) if a non-compatible welding consumable is used, the weld and any conventional steel is to be coated in accordance with the requirements of Sections 4 and 5 of this procedure, using Lloyd’s Register approved cargo oil tank coating products. The use of additional corrosion protection by the use of coatings is to be recorded in the vessel’s Coating Technical File.

6.3 Verification

During construction Lloyd’s Register will verify that the specified grades of corrosion resistant steel have been applied at the appropriate locations. This verification activity shall be on a sampling basis, with the frequency determined from the shipyard quality control records. Any non-compliant locations are to be identified to the shipyard, who shall formulate a plan of corrective action. Such corrective action shall be recorded in the Technical File.

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

A complete Technical File is to be submitted to Lloyd’s Register for review prior to ship delivery.

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

Section 7: References


7.2. LR Verification Guidelines for the Application of the Performance Standard for Protective Coatings (PSPC) for Dedicated Seawater Ballast Tanks, January 2013, Class Direct, ShipRight Procedures.