Protective coating systems for seawater ballast tanks and double-side skin spaces - Non-metallic materials
FOREWORD

DNV GL class programmes contain procedural and technical requirements including acceptance criteria for obtaining and retaining certificates for objects and organisations related to classification.

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This is a new document.
SECTION 1 GENERAL

1 Introduction

1.1 Objective
The objective of this class programme (CP) is to describe the type approval (TA) scheme for protective coating systems for seawater ballast tanks and double-side skin spaces.

The general requirements for obtaining DNV GL type approval certificate is given in class programme DNVGL CP 0338 Type Approval scheme.

The procedures and requirements described in this CP are applicable for obtaining TA certificate based on requirements in:
— IMO Resolution MSC.215(82), Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-side Skin Spaces of Bulk Carriers (IMO PSPC-WBT)
— The standards listed in the IMO Resolution MSC.215(82),
— IMO MSC.1/Circ.1465 Unified Interpretations of the Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-side Skin Spaces of Bulk Carriers (Resolution MSC.215(82)), regularly updated
— IACS UI SC 223, For Application of SOLAS Regulation II-1/3-2 Performance Standard for Protective Coatings (PSPC) for Dedicated Seawater Ballast Tanks in All Types of Ships and Double-side Skin Spaces of Bulk Carriers, adopted by Resolution MSC.215(82), regularly updated
— IACS Recommendations No. 101, IACS Model Report for IMO Resolution MSC.215(82) Annex 1 Test Procedures for Coating Qualification (REC 101)
— IACS Recommendations No. 102, IACS Model Report for IMO Resolution MSC.215(82) Annex 1 Test Procedures for Coating Qualification, Section 1.7 - Crossover Test (REC 102)
— DNV GL rules for classification, ships, RU SHIP Pt.6 Ch.1 Sec.9

Guidance note:
This class programme is not applicable for obtaining EU Marine Equipment Directive (MED) certificates. Visit www.dnvgl.com for information on MED certification.

1.2 Scope
This CP gives a description of the procedures and requirements related to documentation, design and type testing applicable for TA of protective coating systems for seawater ballast tanks and double-side skin spaces.

This CP does not set the design requirements to the protective coating systems - seawater ballast tanks and double-side skin spaces. TA is based on compliance with design requirements given in the Society’s rules and/or other regulations and standards. The CP describes how to document compliance with the requirements in order to obtain a TA certificate for the equipment. This includes, where relevant, technical requirements for how the type tests shall be performed.

A DNV GL type approval certificate will cover one grade of the actual product with the possibility to include variants.

For the coating system this means:
— grade: full coating system, including one or more coats (as per system definition)
— variants: colour variants and similar

A DNV GL Type Approval Certificate is normally limited to one manufacturer at one production site.

The approval is solely connected to the corrosion prevention properties of the coating system. The approval does not include any evaluation of toxicity, contamination, pollution, or fire technical properties.
Type tests as specified in Sec.2 [3], are to be carried out and verified in one of the following ways:
— at a DNV GL laboratory
— at a recognized and independent laboratory or a laboratory accepted by the Society
— at the manufacturer's premises in the presence of a surveyor.

As the approval of service supplier, see CP 0277, may be granted to laboratories either independent of the coating manufacturer or to the coating manufacturer's own laboratory there will be different follow-up from the surveyor during the testing period.

When actual testing, forming basis for test reports used to seek type approval from the Society, is carried out at the coating manufacturer's own laboratory the responsible surveyor shall be called in for witnessing milestones, typically:
— witnessing of selection of paint material from stock if applicable
— witnessing of sample surface preparation
— witnessing of primer application and weathering
— examination of surface and preparation prior to application of top coat
— witnessing of top coat application
— witnessing during testing
— witnessing evaluation of test.

Please refer to Appendix A for flow charts showing the involvement from class (i.e. surveyor).

1.3 Application

The DNV GL rules RU SHIP Pt.6 Ch.1 Sec.9 and IMO MSC.215(82) require that protective coating systems for seawater ballast tanks and double-side skin spaces are type approved in accordance with this CP for seawater ballast tanks and double-side skin spaces on vessels classed with the Society.

A TA certificate in accordance with this CP will confirm compliance with the requirements given in [1.1]. The TA certificate will not confirm compliance with requirements in other parts of the rules. In case additional requirements in other parts of the rules shall be covered by the TA certificate, this shall be specified in the application for TA and will be stated in the TA certificate.

2 Documentation

For TA of protective coating systems for seawater ballast tanks and double-side skin spaces the following documentation shall be submitted by the manufacturer at initial type approval, and updated at renewal. The documentation shall, to the extent possible, be submitted as electronic files. The manufacturer shall keep one (1) copy of type approval documentation in their own file. The documentation that forms the basis for the TA shall be easily available for the surveyor at the TA applicant's premises. When documentation is submitted in paper format, normally two copies of the documentation shall be submitted to the Society. No documentation will be returned to the company applying for TA.

The documentation shall be in the English language, if not otherwise agreed. (Please number documentation according to below list to facilitate review):
1) the Society's type approval application form shall be completed with the following information:
   — type designation, i.e. product name (grade) with list of variants to be included in, and stated on, the type approval certificate
   — name and address of manufacturer, to be listed on type approval certificate. Additionally, the following shall be specified, if applicable:
     — contact person
     — phone and fax numbers
     — e-mail and web address
2) product description (number and type of components, colour, consistence, etc.)
3) field of application and special application limitations of the product (temperature, dry film thickness, number of coats etc.)
4) product specification/technical data sheet/material safety data sheet, with relevant product information
5) description of fabrication process
6) description of quality control arrangement including copies of the relevant certificates with issue number and/or date (e.g. Quality management system certification)
7) type test results with references to standards, methods etc. and relevant calibration certificates for equipment used in type tests (if applicable)
8) information regarding marking of the product or package
9) in-service experience, if available.

1 To be verified during initial type approval survey prior to the issuance of the type approval certificate
SECTION 2 REQUIREMENTS

1 Design requirements

The Protective Coating Systems - Seawater Ballast Tanks and Double-side Skin Spaces shall comply with the relevant requirements of the following publications:

— IMO Resolution MSC.215(82), Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-side Skin Spaces of Bulk Carriers (IMO PSPC-WBT)
— the standards listed in the IMO Resolution MSC.215(82)
— IMO MSC.1/Circ.1465 Unified Interpretations of the Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in all Types of Ships and Double-side Skin Spaces of Bulk Carriers (Resolution MSC.215(82)), regularly updated
— IACS UI SC 223, For Application of SOLAS Regulation II-1/3-2 Performance Standard for Protective Coatings (PSPC) for Dedicated Seawater Ballast Tanks in All Types of Ships and Double-side Skin Spaces of Bulk Carriers, adopted by Resolution MSC.215(82), regularly updated
— IACS Recommendations No. 101, IACS Model Report for IMO Resolution MSC.215(82) Annex 1 Test Procedures for Coating Qualification(REC 101)
— IACS Recommendations No. 102, IACS Model Report for IMO Resolution MSC.215(82) Annex 1 Test Procedures for Coating Qualification, Section 1.7 - Crossover Test (REC 102)
— DNV GL rules for classification of ships, RU SHIP Pt.6 Ch.1 Sec.9

The type approval comprises the shop primer and main coating in liquid condition and in the condition when applied in full compliance with the manufacturer’s recommendations (see Sec.1 [2] item 2) to 4)).

Quality control during surface preparation or application of the shop primer and main coating is, however, not included in the type approval.

The type approval certificate is invalid if the formulation of the main coating is changed to a degree deemed significant by the Society or if the formulation of any of the listed pre-qualified shop primers is changed to a degree deemed significant by the Society that shop primer cannot be used as part of the protective coating system.

The coating manufacturer shall inform the Society about changes to technical data sheets and material safety data sheets as well as significant changes in the application procedures (e.g. changes in the maximum or minimum overcoating interval) . Guidelines on formulation and name changes in relation to IMO PSPC coating system type approval can be found in App.B.

2 Requirements to production and quality control arrangement

The manufacturer should have a quality system that meets ISO 9001 standards, or equivalent. If this quality standard is not fulfilled, the extent of type testing and assessments will be specially considered.

The quality control arrangement is to be checked with respect to:

— control of incoming materials
— test equipment, test methods, test samples and reference to standards used
— traceability and marking system
— production test reports, production records
— storage conditions and procedures.

3 Requirements to material

The coating product including any variants is to be defined and documented as given in Sec.1 [2].

The requirements to coating properties and performance in field or laboratory exposure are described below for the alternative test methods.

Guidance note:
A prerequisite is that the laboratory, either recognised and independent from the coating manufacturer or the coating manufacturer's own laboratory, involved with testing of coating systems in accordance with IMO Resolution MSC.215(82), IACS U1 SC 223 and IMO MSC.1/Circ.1465, is approved as a service supplier in accordance with IACS UR Z17, as amended. DNVGL CP 0277 “Laboratories engaged in testing of coating systems (IMO PSPC)” will be presented to those interested in obtaining such approval.

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### 3.1 IMO Resolution MSC.215(82) test procedures

**Method 1**

For coating systems to be used in dedicated sea water ballast tanks and double-side skin spaces of bulk carriers.

The test procedures are outlined in:
- IMO Resolution MSC.215(82), Annex 1, Appendix 1 *Test on simulated ballast tank condition*
- IMO Resolution MSC.215(82), Annex 1, Appendix 2 *Condensation chamber test*.

*Acceptance criteria:*

Ref. IMO Resolution MSC.215(82), Annex 1, Appendix 1, Section 3 and Appendix 2, Section 3.

If type testing according to method 1 has been carried out, and the results found to be satisfactory, the following will be stated on the type approval certificate:

“For use in ballast tanks, double-side skin spaces, cofferdams and similar areas. Surface preparation and coating application as per PSPC or manufacturer's recommendations, whichever is stricter”.

IACS' model report should be used as basis for the coating test laboratory’s own test report format.

**Method 2**

For coating systems to be used in double-side skin spaces of bulk carriers.

The test procedure is outlined in:
- IMO Resolution MSC.215(82), Annex 1, Appendix 2 *Condensation chamber test*.

*Acceptance criteria:*

Ref. IMO Resolution MSC.215(82), App.1, Appendix 2, Section 3.

If type testing according to method 2 has been carried out only, and the results found to be satisfactory, the following will be stated on the type approval certificate:

“For use in double-side skin spaces. Surface preparation and coating application as per PSPC or manufacturer's recommendations, whichever is stricter”.

IACS' model report should be used as basis for the coating test laboratory’s own test report format.

### 3.2 Marintek test procedure

**Method 3**

For coating systems to be used in dedicated sea water ballast tanks and double-side skin spaces of bulk carriers.

The full method, including acceptance criteria, is described in Marintek, Sandefjord, report no. 23.1139.02 *Corrosion Protection of Tanks and Cargo Hold, No. 2, 2 b, 2 c, Testing and Classification of Coatings* issued from January 1994 onwards, including amendments.

In brief, the method consists of:
- coating material identification procedure
- wave tank test
- condensation chamber exposure.

*Acceptance criteria:*
Coating systems with results B1 classification (no blisters and 0% rusted panel surface area) are acceptable for type approval.

Test reports issued before 2006-12-08 are accepted.

As the most of the Marintek and the Society’s reports do not include IR/finger print, such information is to be established from current production and the coating manufacturer shall give a confirmation that the current product is identical to the one originally tested.

If type testing according to method 3 has been carried out, and the results found to be satisfactory, the following will be stated on the type approval certificate:

“For use in ballast tanks, double-side skin spaces, cofferdams and similar areas. Surface preparation and coating application as per PSPC or manufacturer’s recommendations, whichever is stricter”.

3.3 Field exposure

Method 4

For coating systems to be used in dedicated sea water ballast tanks and double-side skin spaces of bulk carriers, or only for use in double-side skin spaces of bulk carriers.

The requirements to field exposure are given in IMO Resolution MSC.215(82), Table 1 item 3 (1.3).

Further reference is given to the latest revisions of IACS UI SC 223 and IMO MSC.1/Circ.1465 regarding the latest IACS/IMO interpretation on this matter.

If field exposure according to method 4 has been carried out, and the results found to be satisfactory, the following will be stated on the Type Approval Certificate:

“For use in ballast tanks, double-side skin spaces, cofferdams and similar areas. Surface preparation and coating application as per PSPC or manufacturer’s recommendations, whichever is stricter”.

3.4 Alternative systems

Method 5

For coating systems to be used in dedicated sea water ballast tanks and double-side skin spaces of bulk carriers, or only for use in double-side skin spaces of bulk carriers.

All systems that are not an epoxy based system, and/or systems not applied according to Table 1 of the IMO Resolution MSC.215(82) are defined as an alternative system.

It is not meant to exclude other alternative systems with proven equivalent performance, for example non-epoxy based systems.

Acceptance of alternative systems will be subject to documented evidence that they ensure a corrosion prevention performance at least equivalent to that indicated in the IMO Resolution MSC.215(82).

As a minimum, the documented evidence shall consist of satisfactory performance corresponding to that of a coating system which conforms to the “coating standard” described in the IMO Resolution MSC.215(82), Section 4, i.e. a target useful life of 15 years in either actual field exposure for 5 years with final coating condition not less than “GOOD” or laboratory testing. The laboratory testing shall be carried out in accordance with the test procedure and acceptance criteria given in the IMO Resolution MSC.215(82), Annex 1, Appendix 1 Test on simulated ballast tank condition and Appendix 2 Condensation chamber test.

Further reference is given to the latest revisions of IACS UI SC 223 and IMO MSC.1/Circ.1465 regarding the latest IACS and IMO interpretation on this matter.

If type testing according to method 5 has been carried out, and the results found to be satisfactory, the following will be stated on the Type Approval Certificate:

“For use in ballast tanks, double-side skin spaces, cofferdams and similar areas. Surface preparation and coating application as per PSPC or manufacturer’s recommendations”.

In addition it will be stated on the Type Approval Certificate that the coating system has been accepted as “Alternative system” with clear indication of this categorisation, i.e. not epoxy based and/or not applied according to Table 1 of the IMO Resolution MSC.215(82) with further application notes.
IACS model report should be used as basis for the coating test laboratory’s own test report format.

### 3.5 Cross-over tests – compatibility test

This sub-section is relevant for method 1-5, excluding method 4.

If a zinc silicate shop primer has passed the pre-qualification test as part of coating system (i.e. shop primer plus epoxy main coating), it may be used in combination with other epoxy main coatings that have passed the pre-qualification test as part of another coating system, provided that the compatibility has been confirmed by the test in accordance with IMO Resolution MSC.215(82), Paragraph 1.7 of Appendix 1 to Annex 1 *Test on simulated ballast tank condition* without wave movement.

The cross-over tests are also to be carried out by a laboratory approved as a service supplier (DNVGL CP 0277).

When cross-over tests have been carried out and reported satisfactorily the information may be included to the type approval certificate.

IACS’ model report should be used as basis for the coating test laboratory’s own test report format.

### 3.6 Summary

**Table 1 Type Testing - Laboratory Testing and Field Testing (summary)**

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Standard</th>
<th>Number and selection of parallels</th>
<th>Value</th>
<th>Definition of Value</th>
<th>Minimum level of verification</th>
<th>Frequency of verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coating durability (visual assessment)</td>
<td>Method 1 IMO Resolution MSC.215(82), App.1, Appendix 1 and Appendix 2, wave tank and condensation chamber test cycle</td>
<td>see details in [3.1]</td>
<td>acceptance criteria in IMO Resolution MSC.215(82)</td>
<td>see details in [3.1]</td>
<td>Report by a laboratory approved as a Service Supplier</td>
<td>initial assessment</td>
</tr>
<tr>
<td></td>
<td>Method 2 IMO Resolution MSC.215(82), App.1, Appendix 2, condensation chamber test cycle</td>
<td>see details in [3.1]</td>
<td>acceptance criteria in IMO Resolution MSC.215(82)</td>
<td>see details in [3.1]</td>
<td>report by a laboratory approved as a Service Supplier</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Method 3 Marintek’s identification, wave tank and condensation chamber test cycle</td>
<td>see details in [3.2]</td>
<td>class B1.</td>
<td>see details in [3.2]</td>
<td>report by independent laboratory, or sampling and testing witnessed by the Society</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Method 4 Field exposure Field test under real life exposure conditions for min. 5 years</td>
<td>see details in [3.3]</td>
<td>final coating condition not less than “GOOD”</td>
<td>see details in [3.3]</td>
<td>report by independent institution, or, preferably, by a surveyor</td>
<td></td>
</tr>
<tr>
<td>Property</td>
<td>Test Standard</td>
<td>Number and selection of parallels</td>
<td>Value</td>
<td>Definition of Value</td>
<td>Minimum level of verification</td>
<td>Frequency of verification</td>
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<tr>
<td>Method 5 Alternative Systems</td>
<td>All systems that are not an epoxy based one and/or systems not applied according to table 1 of the IMO Resolution MSC.215(82) are defined as an alternative system. The performance is to be shown in accordance with either method 1, 2 or 4</td>
<td>see details in [3.4]</td>
<td>final coating condition not less than &quot;GOOD&quot;</td>
<td>see details in [3.4]</td>
<td>report by independent institution, or, preferably, by a surveyor</td>
<td></td>
</tr>
<tr>
<td>Cross-over test IMO Resolution MSC.215(82), Paragraph 1.7 of Appendix 1 to Annex 1, Test on simulated ballast tank condition (without wave movement)</td>
<td>see details in [3.5]</td>
<td>acceptance criteria in IMO Resolution MSC.215(82)</td>
<td>see details in [3.5]</td>
<td>report by a laboratory approved as a service supplier</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Applications:
1) Method 1: for use in dedicated sea water ballast tanks and double-side skin spaces of bulk carriers
2) Method 2: for use in double-side skin spaces of bulk carriers
3) Method 3: for use in dedicated sea water ballast tanks and double-side skin spaces of bulk carriers
4) Method 4: for use in dedicated sea water ballast tanks and double-side skin spaces of bulk carriers, or only in double-side skin spaces of bulk carriers
5) Method 5: for use in dedicated sea water ballast tanks and double-side skin spaces of bulk carriers, or only in double-side skin spaces of bulk carriers.

4 Requirements to marking of product
The product shall be marked. The marking shall at least include the following information:
— manufacturer’s name and address or trade mark
— production plant/place of manufacture
— type designation/product name
— production date/batch no
— storage instruction/shelf life (if relevant).

The marking shall be made in such a way that it is visible, legible and indelible. The marking of products should enable traceability to the Society's type approval certificate.
APPENDIX A WORK PROCESSES

Case 1 - Independent Test Laboratory

MANUFACTURER
- Confirm Class site approval

LABORATORY
- Confirm class lab approval
- Order placed on laboratory
- Sample surface preparation
- Primer application & weathering
- Top coat application
- Laboratory testing
- Pass/fail

CLASS

- Approval

Appliy to Class for Type Approval

- Issue report to manufacturer

Decide on corrective action

No

- Report Acceptable

Yes

Issue Type Approval Certificate
APPENDIX B GUIDELINES ON FORMULATION AND NAME CHANGES IN RELATION TO IMO PSPC COATING SYSTEM TYPE APPROVAL

1 Allowed changes without reference to the Society
   — generic equivalent raw material substitutions to allow best use of local suppliers and costs.
   — changes to formulations where the infrared (IR) identification (“fingerprint”) or the specific gravity (SG) of each component is not changed to alter drying/application performance to suit local ambient conditions and shipyard practices. This could involve:
     a) changes in thixotrope package to improve hold up
     b) change in solvent to speed up/slow down drying
     c) changes in, or addition of, additives, e.g. to control flow and levelling or to prevent bubbling, pinholing or other film defects
   — adjustment in level or type of inert colouring pigments for paint colour changes
   — change in specific gravity by not more than +/-0.05g/ml
   — change in the absolute quantity of any raw material in a formulation by not greater than 2% to allow for use of different manufacturing equipment or and/or manufacture of different batch sizes, e.g. if a raw material is nominally present as 10% by weight in a formulation, a range of 9.8 – 10.2% may be used.

2 Allowed changes without reference to the Society, but without re-testing to IMO PSPC
   — addition of, or change in level of, catalyst where the IR “fingerprint” is not changed.
   — change in hydrolysis and esterification level of binders in zinc silicate shop primers.
   — change in extender pigment type, where the IR “fingerprint” is not significantly changed.
   — change in pigment volume concentration (PVC) by not more than +/-2%.
   — any change that does not alter the dry paint film composition, e.g. change in product mixing ratio where the mixed formulation remains the same
   — changes of solvent blends that change the SG of each component
   — changes of name and/or type designation without any formulation change.

   Note:
   Formulation changes of this type shall be strictly controlled and shall be dependent on successful completion of significant internal test programme.

3 Allowed changes without full re-testing to IMO PSPC and subsequent type approval
   — any changes that significantly alter the IR “fingerprint” of the coating
   — significant changes (greater than +/-2%) to pigment volume concentration (PVC)
   — changes to the film forming resin system
   — changes to resin system including hardener
   — addition of modifying resins
   — change to type, or level, of active pigments, e.g. zinc dust in shop primers and aluminium in water ballast tank coatings.
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