CLASS PROGRAMME

Approval of manufacturers

DNVGL-CP-0245       Edition May 2016

Clad steel and steel-aluminium transition joints
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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Any comments may be sent by e-mail to rules@dnvgl.com

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CHANGES – CURRENT

This is a new document.
# CONTENTS

Changes – current.......................................................................................................................... 3

Section 1 General.......................................................................................................................... 5
1 Objective.................................................................................................................................... 5
2 Scope and application.............................................................................................................. 5
3 Request for approval................................................................................................................ 5

Section 2 Documentation requirements....................................................................................... 7
1 Manufacturer specification......................................................................................................... 7
2 Information on manufacturing route and equipment.............................................................. 7
3 Test results and records........................................................................................................... 8

Section 3 Approval testing.......................................................................................................... 10
1 Test product and testing scope................................................................................................ 10
2 Testing requirements................................................................................................................ 10

Appendix A Approval coverage of material grades and steel types.......................................... 12
1 General...................................................................................................................................... 12
**SECTION 1 GENERAL**

**1 Objective**

The objective of this class programme (CP) is to provide a description for which the Society bases its approval of manufacturers intending to supply clad steel products and steel-aluminium transition joint products in accordance with RU SHIP Pt.2 or other applicable standards provided by the Society.

**2 Scope and application**

This programme is applicable for the approval of material manufacturers of:

— clad steel
— steel-aluminium transition joints

as referred in the Society’s rules and standards. For a description of general requirements, conditions and procedures related to the approval, please refer to DNVGL CP 0346 which shall be applied in combination with this programme.

This programme is applicable for the approval of manufacturers of products as indicated in Table 1.

**Table 1 Range of approval:**

<table>
<thead>
<tr>
<th>Application areas as per RU SHIP Pt.2 Ch.2</th>
<th>Clad steel plates</th>
<th>Steel-aluminium transition joints</th>
</tr>
</thead>
<tbody>
<tr>
<td>RU SHIP Pt.2 Ch.2 Sec.4 [2]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RU SHIP Pt.2 Ch.2 Sec.4 [3]</td>
<td></td>
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</tbody>
</table>

The product(s) used for approval testing (see Sec.3) will place limitations on the range of approval. The approval will be limited to (see App.A):

— each process
— each combination of materials (steel type groups)
— each condition of supply
— each dimension.

The term “steel type groups” is applied for:

— carbon and carbon-manganese (C and C-Mn) steels
— the individual alloy steels
— the individual stainless steels

The manufacturer’s own heat treatment facilities shall be evaluated and approved by the Society, either under this approval programme, or as approved “heat-treatment workshop” based on the approval programme DNVGL CP 0351.

Where heat treatment is performed by a sub-supplier, the sub-supplier shall be approved by the Society as heat-treatment workshop in accordance with DNVGL CP 0351.

**3 Request for approval**

When applying for AoM, the manufacturer shall indicate the base material steel type groups and clad metal types (or the wrought aluminium grades, resp.,) to be covered by the approval, including manufacturing method, dimensions (width, length, thickness) and supply conditions as per [1.2]. For this a list or table shall be given, including at least:

— type of products
— manufacturing method
— range of applicable product sizes (dimensions and weight)
— applicable steel type groups
— applicable cladding materials
— reference to relevant grade of DNV GL rules for the applicable chemical composition, mechanical properties and heat treatment (if applicable). Materials manufactured to other standards are subject to agreement
— a list of suppliers for starting material and a copy of their manufacturer approval certificate.
SECTION 2 DOCUMENTATION REQUIREMENTS

1 Manufacturer specification

All information required in the following and which is not explicitly given by the Society’s rules, shall be summarized in a "manufacturer specification". This shall be a separate document, traceable with document number, version number, dated and signed.

2 Information on manufacturing route and equipment

2.1 Manufacturing summary

Manufacturer shall submit documentation of the specific manufacturing process and related production records for products for which approval is requested. Documentation shall include manufacturer’s metallurgical specifications related to the production facilities and processes as described below.

2.2 Production facilities and equipment

The following information shall be submitted:
— type of heating furnaces and dimensions (see also [2.3.2]),
— equipment for surface preparation of base material and cladding material (and aluminium bonding material, resp.)
— equipment for cladding (or aluminium bonding, resp.)
— cutting and machining devices.

2.3 Cladding procedure (for clad products)

All relevant details for the applied cladding procedure shall be submitted, e.g. for cladding by rolling:
— reheating temperature and time
— descaling treatment
— rolling temperatures, rolling pressures and number of passes, cooling, etc.

2.4 Steel-aluminium bonding procedure (for steel-aluminium transition joints)

All relevant details for the applied steel-aluminium bonding procedure shall be submitted, e.g. for bonding by explosion:
— charge size
— standoff distance
— charge type
— process sequencing, etc.

2.5 Sealing of edges

The method for sealing of edges of the products shall be stated.
2.6 Heat treatment (if applicable)
The following information shall be submitted:
— type of furnace and dimensions
— heating source
— sketch indicating the positions of thermocouples
— working zone dimension and sketch of working zone
— accuracy and calibration status of temperature control devices
— furnace uniformity test report
— furnace loading plan and procedure
— heat treatment procedures, specifying temperatures and holding times, and where applicable, information about heating and cooling rates, and quenching medium
— any re-heat treatment procedure to be given, if applicable

2.7 Surface cleaning
Methods of cleaning and pickling shall be stated.

2.8 Welding (if applicable)
The following information shall be submitted:
— description of the welding plant
— equipment
— qualifications of welders and welding supervisors
— welding specifications (WPS)
— reports on welding procedure qualification tests (WPQR)
— unless otherwise agreed with the Society, the scope of welding procedure tests shall comply with RU SHIP Pt.2 Ch.4 Sec.5 and documented as described in approval of welding workshop (WWA) programme DNVGL CP 0352.

2.9 Non-destructive testing
The following is required:
— description of the equipment for non-destructive testing (e.g. ultrasonic testing)
— procedures for non-destructive testing
— evidence for calibration of equipment
— evidence for qualification of personnel
— demonstration of efficiency of ultrasonic testing equipment and of the calibration by equivalent products which are furnished with artificial defects.

3 Test results and records
Additional requirements for reporting of test results:
— Chemical composition:
  — a summary of the sampling practices and methods for chemical analysis is to be submitted
  — the chemical composition shall be reported in percentage by mass
  — the report shall give the specified limits and the measured content of all the required elements.
— Mechanical testing and corrosion testing:
  — to be reported in accordance with the relevant rule requirements.

— Metallographic examination:
  — high quality photomicrographs shall be presented with a brief description. The magnification shall be indicated on the micrographs by a line symbol, e.g. with length of 0.5 mm or 100 µm. Arrows or letters may be used to identify features referred to in the report.

— Visual examination:
  — report/record for visual inspection, dimensional measurements and surface condition.

— Non-destructive testing:
  — detailed records of non-destructive testing with clear conclusions written by qualified personnel shall be submitted, giving the extent of testing, methods of testing, acceptance criteria, and qualification of the NDT operator.

— Other tests (if applicable)
SECTION 3 APPROVAL TESTING

1 Test product and testing scope

1.1 General
Test products shall be selected so that the testing will cover and qualify the full range of the intended approval scope, see Sec.1 [3].
Pre-materials / starting materials for qualification testing shall be procured from DNV GL approved steelmaker/rolling mill, approved for the relevant grades.

1.2 Extent of approval testing
Test plan shall be proposed by the manufacturer and agreed with the Society. The following extent of testing is required as a minimum:
— two products for each cladding/bonding process
— two products for each combination of materials
— two products for each supply condition
Base material plates and cladding plates for testing shall originate from different heats.
One product shall be of the maximum thickness to be approved.
The other product should represent the average thickness, unless otherwise agreed.
Where two or more material grades shall be covered by the approval testing, subject to agreement with the Society the extent of the testing may be reduced to one heat per material type, see App.A.

1.3 Selection and position of the test samples
The selection of test samples shall be representative of the products for which approval is requested, including chemical composition. Test samples shall be taken out in final delivery condition and shall not be subjected to any separate heat treatment. The test samples shall be taken from both ends of each test product selected for the approval test.
Where there are no rule requirements, sampling positions may be proposed by the manufacturer and then agreed on case by case basis.

2 Testing requirements

2.1 Chemical composition
The following is required (works (W) material certificates from pre-material manufacturer approved by DNV GL will be accepted):
— for all materials the chemical composition as required by the DNV GL rules shall be given
— the chemical composition as determined both by heat and product analysis shall comply with the corresponding DNV GL rule requirements.
2.2 Mechanical testing, corrosion testing and NDT

The scope of testing is prescribed in RU SHIP Pt.2 Ch.2 Sec.4 [2]. Test results shall comply with the relevant acceptance criteria. In addition, the following requirement apply:

- For steel-aluminium transition joints:
  - Maximum product thickness shall be ≥15mm in order to ensure adequate sampling for through thickness tensile testing (unless otherwise agreed).

2.3 Microstructural investigation

For the interface between base plate and cladding material representative photomicrographs shall be prepared as follows:

- For clad products: with magnification 100:1 and 400:1,
- For steel-aluminium transition joints: with magnification 20:1 and 100:1.

2.4 Visual examination

Visual examination shall be conducted and recorded according to the relevant rules:

- the surfaces shall be adequately prepared for inspection
- the surfaces shall not be hammered, peened or treated in any way which may obscure discontinuities
- examination shall be done for all applicable sides and areas, and the manufacturer shall ensure that lifting devices for handling and turning of the products are available
- measurements shall be made on all applicable dimensions
- manufacturer shall present representative products used for approval purpose and preferably several other products from the current production to the surveyor, including reports for visual inspection of the products and surface condition.

2.5 Non-destructive testing

- Each product shall be subjected to ultrasonic testing in accordance with the requirements of DNV GL rules
- Detailed records of ultrasonic testing with conclusions, the extent of testing, acceptance criteria, and qualification of NDT personnel shall be prepared.

2.6 Other tests (if applicable)

- Other applicable tests which are carried out by the manufacturer, e.g. thermal cycle etc. should be reported.
# APPENDIX A APPROVAL COVERAGE OF MATERIAL GRADES AND STEEL TYPES

## 1 General

<table>
<thead>
<tr>
<th>DNV GL Rules reference:</th>
<th>Steel types/material grades for base plate material</th>
<th>Limitation of approval coverage</th>
</tr>
</thead>
</table>
| RU SHIP Pt.2 Ch.2 Sec.4 [2] | For base plate, same grouping as per DNVGL CP 0243 and DNVGL CP 0244 | — cladding process  
— cladding steel grade  
— combination of cladding steel grade and base plate material steel group  
— condition of supply  
— maximum thickness of clad plate and base material plate each |
| RU SHIP Pt.2 Ch.2 Sec.4 [3] | | — product shape (plate, rod or circular blank)  
— bonding process  
— wrought aluminium grade  
— combination of wrought aluminium type and base plate material steel group  
— maximum thickness of wrought aluminium and of base material |
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