DNV·GL

CLASS PROGRAMME

Approval of manufacturers

DNVGL-CP-0421 Edition May 2017

Fibre reinforced plastics

DNV GL AS

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.

Any comments may be sent by e-mail to *rules@dnvgl.com*

CHANGES – CURRENT

This is a new document.

CONTENTS

SECTION 1 GENERAL

1 Objective

The objective of this class programme (CP) is to provide a process on which the Society bases its approval of non-metallic material manufacturers intending to supply fibre reinforced plastics (FRP). The objective of AoM is to verify the manufacturer's ability to consistently manufacture materials and products to the given specification and according to the DNV GL rules requirements.

2 Scope and application

This programme is applicable for the approval of manufacturers of:

— fibre reinforced plastics (FRP),

as referred to in the Society's rules and standards.

Approval is required for, and limited to each kind of manufacturing process.

Where type approval (TA) is required, the manufacturing, documentation and technical requirements including testing shall also comply with the relevant TA programme.

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.

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This CP can be used accordingly for manufacturers applying adhesive bonding.

This CP does not set the design requirements to fibre reinforced plastics. It is based on compliance with requirements given in the Society's rules and/or other regulations and standards.

An AoM certificate in accordance with this CP will confirm compliance with the requirements in DNVGL-RU-SHIP Pt.2 Ch.3 or other applicable standards provided by the Society. In case additional requirements given in other parts of the rules shall be covered by the AoM, this shall be specified in the application for AoM and will be stated in the AoM certificate.

Where required by the Society rules, type approval certificate is required for each type of:

— fibre
— resin
— sandwich adhesive
— sandwich core material
— adhesive (used for adhesive bonding).

3 Request for approval

Request for approval of manufacturer (AoM) shall be made on application form provided by the Society. It shall be completed by the customer and shall be submitted to the Society together with the required documentation listed in Sec.2.

4 Technical pre-evaluation

Before submitting an official quotation, an audit of the manufacturer may be requested by the Society.

5 Limitations

Approval is limited to the facilities/production line and premises/plant used for manufacturing of type approved products. The manufacturer shall clearly indicate which manufacturing and production facilities

shall be included in the approval, and shall produce the test products accordingly. The Society's scope of surveys, assessments and approval testing is limited to the process and products covered by the application for approval. Significant changes to the manufacturing facilities or processes shall be reported to the Society. The Society may request new surveys and approval testing as found necessary. Relocation of approved manufacturing facilities either in full or part will normally require new initial approval. Where required by the Society's rules, the manufacturer shall prepare a product specification for the manufacturing process, material composition, etc. The approval is limited to the process and composition etc. as given by this product specification.

6 Sub-contracting

For production steps performed by sub-contractor(s) information to the same level of detail as requested with this CP shall be submitted. The Society may require surveys of relevant sub-contractors in the course of the approval procedure. The manufacturer requesting approval by the Society shall ensure adequate quality of the sub-contracted production steps. Sub-contracting of relevant production steps shall be entrusted only to those sub-contractors named in the approval documentation, unless the sub-contractor is holding an appropriate AoM. Further limitations may be given on the AoM certificate.

7 Documentation requirements

The manufacturer shall prepare the approval documentation as required in Sec.2.

8 Testing

Society assesses whether for the product in question approval testing is required. The manufacturer shall prepare an appropriate test plan in detail in accordance with the relevant class programme.

Society shall agree on the test plan before testing is commenced.

9 Works' survey

The manufacturer shall organize a works survey together with the Society's representative. Focus will normally be given to quality control of critical production steps, and that manufacturing, testing and inspection facilities are available and supervised/operated by qualified personnel. The Society decides the scope of the survey, and may request additional documentation when preparing for the works survey. Extension of the survey is required if any nonconformity is observed during the survey. Manufacture of test products and approval testing may require separate visits. In case of adequate preparation and agreement with the Society, these steps of the approval process may be combined in one or two visits. The representative of the Society will prepare a survey report and include the applicable checklists. The manufacturer shall provide him the necessary access and information in order to complete the report and checklists.

10 Evaluation

The evaluation of compliance with the approval requirements is based on the required documentation, test reports, the surveys, and the survey report with applicable checklists. In case of insufficient documentation or test results the manufacturer will be informed for further actions.

11 Issuance of approval certificate

Provided the manufacturer is found to have adequate qualifications, the evaluation is in compliance with the applicable requirements, all tests are completed and the test results comply with the applicable requirements, an approval of manufacturer certificate will be issued. The certificate will include a list of products covered by the approval. The certificate will be forwarded to the manufacturer, and an entry made in the Society's list of approved manufacturers on the internet (the approval finder).

12 Validity

For initial approval the approval will be valid for three years from the date of issue, without requirement for intermediate assessment, unless otherwise requested by the Society. To maintain the approved status, the manufacturer shall be re-inspected every three years.

Any significant alteration to the approved condition during the period of validity, e.g. as described in the approval documentation as per Sec.2 and relevant individual class programme shall be reported to the Society. The Society will decide if a new survey/re-testing shall be performed.

Any changes to the name of the manufacturer shall be brought to the attention of the Society with official evidence and an application to change the name on the certificate shall be submitted at the earliest.

New requirements introduced in the Society's rules or class programs during the period of validity shall take effect at the next extension, change or renewal of the approval, unless otherwise required by the Society. Updating of the approval documentation or additional approval testing may be required.

Retention testing shall be according to type testing in the relevant type approval programme.

13 Suspension of withdrawal of approval

An approval of manufacturer may be suspended or withdrawn at any time if the Society finds it justified. Provisions for suspension and withdrawal of a certificate are given by DNVGL-RU-SHIP Pt.1 Ch.1.

14 Renewal and extension

14.1 Request for renewal and extension

Application for renewal should be done not later than three months before the expiry date of the certificate. Applications received after the expiry of the certificate may require new initial approval if deemed necessary by the Society.

14.2 Documentation requirements for renewal and extension

For renewal of the AoM, the manufacturer shall submit an assessment report confirming that original approval conditions are maintained and no significant changes have been made to manufacturing process, equipment and procedures. The manufacturer shall prepare a brief summary report giving statistical information related to certified products. If no products have been subject to certification by the Society for a period of two years, the Society reserves the right to require additional surveys and approval tests.

For extension of the AoM, the manufacturer shall submit request and documentation for the products in question, with the same scope of details as for the initial approval, unless Society indicates that scope of details may be reduced.

14.3 Survey

For renewal and extension of the AoM a survey shall be performed and appropriate report shall be prepared.

The manufacturer shall invite the Society's surveyor for renewal survey in order to revisit the critical manufacturing steps and to verify that the approved conditions are maintained. During the survey the manufacturer shall provide evidence that the applicable versions of relevant rules, standards and approval programs are applied, and that all requirements given therein are implemented.

For extension the Society decides about the scope and details of the survey.

14.4 Validity

For renewal the validity time is extended for three years. AoMs which have expired at the time of renewal will be adjusted according to the previous validity date. For extension of an AoM the validity period will not be changed unless the extension is combined with a renewal, i.e. that all corresponding requirements for renewal are fulfilled.

SECTION 2 DOCUMENTATION REQUIREMENTS

1 Application documentation

The information in the application form shall describe the organization, personnel qualification, technical facility, as well as calibration of all testing devices needed for production and quality control. All critical checking points of the workshop inspection shall be indicated. It is the responsibility of manufacturer to fill the application form truthfully and with latest information of the company as follows:

— name and site address of the manufacturer
— certificate of quality management system (QM) ISO 9001 or equivalent
— organization chart
— scope of production, a list of products for which approval is requested
— properties of products to be approved
— proposal for approval-testing programme
— completed application form with signature and date.

2 General manufacturer information

The following information shall be submitted by the manufacturer:

— manufacturing description, focusing on quality control, testing, inspection facilities, equipment and flow chart of manufacturing process
— production facilities
— programme for calibration of equipment
— name of sub-suppliers with site address
— measures to maintain raw material consistency
— procedure for handling and packing of the product from the resin manufacturer to application manufacturer.

3 Quality control and production

3.1 General

QM system should be certified as complying with ISO 9001. If it is not certified, the required QM measures will be assessed by the Society. This QM system shall meet the minimum requirements for a standard QM system.

The QM system shall comprise the organizational structure, responsibilities, procedures, processes and resources for implementing the required quality. It mainly includes QM manual, QM procedure and QM work instructions.

3.2 Work instructions

All work instructions shall be under control by QM system and available to the relevant staff. The release of the work instructions shall fully follow the requirements according to the QM system, and a nominated person for maintenance is recommended.

3.3 Quality control

The quality control is required for all materials and products, including incoming and outgoing goods control.

In-process inspection shall follow manufacturer's work instructions. If no such instruction are available, the Society may request additional tests.

Inspections of finished products shall be performed by manufacturer with clear scope of testing and acceptance criteria.

It shall be ensured that the test machine operators perform the tests with adequate time and quality. Interpretation of standards shall only be done by adequately trained personnel.

It is the manufacturer's responsibility to ensure that effective manufacture and process controls are implemented in production. Where deviation from the controls occurs and this could produce products of inferior quality, the manufacturer shall investigate to determine the cause and establish countermeasures to prevent its recurrence. Investigation reports to this effect shall be made available to Society on request.

3.4 Production facilities

Capacity of production facilities needs to be considered in a way that the products intended for approval are manufactured in series of products. Production at research and development stage will usually not be accepted for AoM.

Maintenance records of all facilities shall be available and registered. Relocation or rebuilt of the facilities shall be recorded and the Society shall be informed. Society assesses if a re-approval is required.

3.5 Warehouse

Warehouse management system and work instructions shall be fully implemented. Stock rotation by first in first out system shall be practiced in the warehouse.

Storage shall be arranged in such a way that the identification of the materials, storage conditions and expiry dates are clearly visible. Materials whose duration of storage exceeds the expiry date shall be removed from the storage and blocked immediately for further application.

The products shall be stored in accordance with the requirements from the material manufacturer or shall follow the Society's requirement. Catalyst, accelerators and gel coats coatings shall be stored in a well-ventilated and temperature controlled warehouse because of the lower flash point properties. Oxidizing and reducing agents shall be stored separately.

The conditions under which raw materials are stored shall be described. As a minimum the range of temperature and relative humidity shall be specified as well as the method of control and logging of these conditions. Cleanliness of the storage area shall be specially addressed as well as precautions if original packaging is broken on stored material.

The storage area shall be free from dust and other types of contamination that will have an adverse effect on the quality of the finished product.

The control of shelf-life of products shall be described.

3.6 Personal qualification and training

The manufacture of laminating resins, adhesives, etc., shall only be carried out by persons who have sufficient professional knowledge. Evidence of the personnel qualification shall be available in such a way that external/internal training courses and specific technical background are documented.

If the production process is modified or changed, the operators shall be re-trained.

3.7 Calibration

All measuring devices shall be calibrated before due date by accredited third parties. An internal calibration plan shall be available for all measuring devices.

If calibration is conducted internally, the calibrated standard materials shall be provided by a qualified third party. Additionally the calibration instructions shall be available.

3.8 Receiving inspection in testing laboratory

The method and documentation of verification of incoming raw materials shall be described. As a minimum the inspection document as per EN 10204-2005 as it is required according to the type approval program shall be verified against the product specification and filed. The materials shall at least be checked for any damage and for compliance of the details in the certificate with the requirements.

Testing carried out, if any, shall be described.

4 Specifications

4.1 Product specification

The procedure for verification of the product specification shall be described. As a minimum the following information shall be agreed on with the client and included in the product specification:

- all relevant geometrical dimensions
- specification of fibre reinforcement(s), resin, sandwich adhesive (if applicable) and sandwich core materials (if applicable). For products and components intended for class only raw materials with valid type approval certificates issued by the Society shall be used
- sequence and angles (with respect to the longitudinal direction of the tube) of all plies for all parts of the laminate(s)
- total weight of reinforcement for all types of reinforcement to be applied
- volume or weight fraction of reinforcement for all parts of the laminate(s).

4.2 Production

The procedure for verification of the cure cycle shall be described. The complete cure cycle shall be agreed on with the client and included in the specification. The following shall be specified in the correct sequential order:

- all rise times
- all hold times
- all temperatures at holds
- all cooling times.

5 Fabrication environment

The environment under which lamination works and other important processes are carried out shall be described. As a minimum the range of temperature and relative humidity shall be specified as well as the method of control and logging of these parameters.

Special attention shall be given to the cleanliness of the fabrication area. The fabrication area shall be free from dust and other types of contamination that will have an adverse effect on the quality of the finished product.

6 Production log

A specification of which and how all relevant production parameters are logged shall be submitted. As a minimum the following shall be logged:

- identification of the part
- fabrication environment (temperature and relative humidity)
- fibres, fabrics, resins, sandwich adhesives (if applicable) and sandwich core materials (if applicable) used

— total weight of fibres and other type of reinforcement applied
— total weight of the part
— dimensions, all relevant diameters, dimensions of taper etc.
— complete description of the cure cycle.

7 Test results and records

All required testing as described in Sec.3 shall be documented and reported.

SECTION 3 APPROVAL TESTING

1 Production testing

The manufacturer shall be able to deliver products and components made of FRP with a consistent level of quality. Production testing shall be used for verification that a consistent level of quality is maintained throughout production.

For testing requirements, see DNVGL-RU-SHIP Pt.2 Ch.3 Sec.3 [5.3] and DNVGL-RU-HSLC Pt.2 Ch.3 Sec.3 [5.3].

CHANGES – HISTORIC

There are currently no historical changes for this document.

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