Cable trays and ducts
(Glass Reinforced Plastic (GRP))

JULY 2014
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Any comments may be sent by e-mail to rules@dnv.com

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General

This is a new document.

Det Norske Veritas AS, company registration number 945 748 931, has on 27th November 2013 changed its name to DNV GL AS. For further information, see www.dnvgl.com. Any reference in this document to “Det Norske Veritas AS” or “DNV” shall therefore also be a reference to “DNV GL AS”.


EU Mutual Recognition Technical Requirements

Cable trays and ducts (Glass Reinforced Plastic (GRP))

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1. PRODUCT DESCRIPTION

1.a General description of the product

Cable Trays and ducts (glass reinforced plastic) used on board ships.

1.b Application limitations

(a) The load on the cable trays/protective casings is to be within the Safe Working Load (SWL). The support spacing shall not be greater than the Manufacturer’s recommendation nor in excess of spacing at the SWL test. In general, the spacing shall not exceed 2 meters;

Note: The selection and spacing of cable tray/protective casing supports are to take into account:

- cable trays/protective casings’ dimensions;
- mechanical and physical properties of their material;
- mass of cable trays/protective casings;
- loads due to weight of cables, external forces, thrust forces and vibrations;
- maximum accelerations to which the system may be subjected;
- combination of loads.

(b) The sum of the cables’ total cross-sectional area, based on the cables’ external diameter shall not exceed 40% of the protective casing’s internal cross-sectional area. This does not apply to a single cable in a protective casing;

(c) Cable trays/protective casings made of plastic materials shall be supplemented by metallic fixing and straps;

(d) When plastics cable trays/protective casings are used on open deck, they are additionally to be protected against UV light;
(e) Penetrations through fire class divisions are out of the scope of this technical requirement.

1.c **Intended use**

Cable trays intended for the support and accommodation of cables and possibly other electrical equipment in electrical and/or communication systems installations on board ships.

1.d **System context**

See 1.a and 1.b.

2. **DESIGN EVALUATION**

2.a **Engineering evaluation requirements**

2.a i. **Technical Requirements**

Each type of cable trays/protective casings shall be assigned a Safe Working Load and is to be designed accordingly.

Cable trays/protective casings are to be designed to the following ambient temperatures:

- -25°C to 90°C for outdoor use
- +5°C to 90°C for indoor use.

Note: Impact test temperature: lowest range of outdoor/indoor ambient (as applicable)

2.a.ii. **Technical documents to be submitted**

The technical specifications and drawings, describing the types for which approval is requested, shall show compliance with the relevant requirements.

2.b **Type testing requirements**

(a) Type tests are to be carried out in accordance with the test requirements as per IEC 61537 as shown in table 1 below.
(b) The test method of impact resistance shall be according to chapter 2.1 of Rec. 73. The test is to be performed according to IEC 60068-2-75 (Impact Resistance):

- i) The test is to be carried out on test samples of cable tray lengths or cable ladder lengths of 250 mm ± 5 mm long. Test samples of ladder are to consist of two side-members with one rung positioned centrally. Test sample of mesh trays is to be prepared in such a way that there will be a wire in the centre;
- ii) Before the test, plastic components are to be aged at a temperature of 90°C ± 2°C for 240 hours continuously;
- iii) The test sample is to be mounted on wooden fibreboard of thickness 20 mm ± 2 mm;
- iv) The test sample to be tested is to be placed in a refrigerator, the temperature within which is maintained at the test temperature with a tolerance of ±2°C;
- v) After 2 hours, the test sample is to be removed from the refrigerator and immediately placed in the test apparatus;
- vi) At 10 s ± 1 s after removal of each test sample from the refrigerator, the hammer is to be allowed to fall with impact energy, the mass of the hammer and the fall height:
  - Approximate Energy 10 J;
  - Mass of Hammer 5.0 kg;
  - Fall Height 200 ± 2 mm;
- vii) The impact is to be applied to the base or the rung in the first test sample, to one of the side members in the second test sample, and to the other side member in the third test sample. In each case, the impact is to be applied to the centre of the face being tested;
- viii) After the test, the test sample is to show no signs of disintegration and/or deformation that will impair safety.

(c) IACS UR E10, Test 21 (Flame Retardant)

(d) IMO Resolution MSC.307(88) (FTP Code 2010) Part 2 (Smoke and toxicity test)

In case the tests are conducted at a Nationally Accredited Laboratory, the presence of the RO’s surveyor may be omitted.
### Table 1

<table>
<thead>
<tr>
<th>IEC 61537 Test reference subclause</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions</strong></td>
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<td>8</td>
<td>Information about the product</td>
<td>Inspection</td>
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<tr>
<td><strong>Construction</strong></td>
<td></td>
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<tr>
<td>9.1</td>
<td>Surface does not damage the cables</td>
<td>Visual and manual inspection</td>
</tr>
<tr>
<td>9.2</td>
<td>When the manufacturer does not declare the use of gloves during installation</td>
<td>Visual and manual inspection</td>
</tr>
<tr>
<td>9.3.1</td>
<td>Screw thread test repeatability</td>
<td>Manual test</td>
</tr>
<tr>
<td>9.3.2</td>
<td>Reusable mechanical connections repeatability</td>
<td>Manual test</td>
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<td>9.3.3</td>
<td>Non-reusable mechanical connection</td>
<td>Visual and manual inspection</td>
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<td>9.4</td>
<td>Apparatus mounting device</td>
<td>Visual inspection</td>
</tr>
<tr>
<td>9.5</td>
<td>Regular perforations over base</td>
<td>Visual inspection and measurement</td>
</tr>
<tr>
<td>9.6</td>
<td>Regular rung pattern over base</td>
<td>Visual inspection and measurement</td>
</tr>
</tbody>
</table>

### Mechanical properties

SWL test procedure
The SWL test procedure is described in IACS Rec No.73 (2002) item 2.2.
-SWL test to be performed on smallest and largest size of cable tray or ladder lengths, having same material, joint and topological shape.
-SWL test temperature to be either max & min only, or max only if there is documentation showing that structural properties decrease when temperature increases, or at any temperature within the range if there is documentation showing that the

| 10.2                              | Required |
structural properties do not differ by more than 5% of the average within the range.
- Max deflection under SWL not to exceed L/100, and no defect at 1.7xSWL (L=distance between supports)
- All loads are to be uniformly distributed over the length and width of the test samples, as shown in 4-8-4A1/Figure 1.
- The loads are to be applied in such a way that a uniform distribution is ensured even in the case of extreme deformation of the test samples.
- To allow for settlement of the test samples, a pre-load of 10% of SWL, unless otherwise specified, is to be applied and held for at least five (5) min, after which the measurement apparatus is to be calibrated to zero.
- Then, the load is to be gradually increased evenly, longitudinally and transversely up to the SWL continuously. When a continuous increase is impractical, the load may be increased by increments. These increments are not to exceed about a quarter of the SWL. The load increments are to be distributed through the load plates longitudinally and transversely as evenly as is practical.
- After loading, the deflection is to be measured at the points specified to give a practical mid-span deflection
- The test sample with load is to be left and the deflections measured every five (5) minutes until the difference between two consecutive sets of readings becomes less than 2% of the first set of the two readings. The maximum deflection for the purpose of 4-8-4A1/5.3i) is the first set of the readings measured at this point under the test load.
- When subject to SWL, the test sample, their joints and internal fixing devices are to show no damage or crack visible to normal view or corrected vision without magnification.
- Then, the load is to be increased to 1.7 times SWL
- The test sample with the load are to be left and the deflections measured every five (5) min until the difference between two consecutive sets of readings becomes less than 2% of the first set of the two readings. The test sample is to sustain the increased loading without collapsing. However, buckling and deformation of the test sample are allowable at this excess loading.

<table>
<thead>
<tr>
<th>10.8.1</th>
<th>Tests for SWL of cantilever brackets</th>
<th>Required</th>
</tr>
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**Electrical properties**

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<th>Electrical non-conductivity</th>
<th>Required</th>
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Cable tray system components shall be deemed electrically non-conductive if having surface resistivity values of 106 Ω.
3. PRODUCTION REQUIREMENTS

Refer to EU RO “Product Quality Assurance (PQA)” procedure (Annex VI of EU RO Framework Document for the Mutual Recognition of Type Approval).

4. MARKING REQUIREMENTS

Manufacturers of the approved equipment are to mark the product for identification and, in addition, at least the following items to be marked at the suitable place:

(a) Manufacturer’s name or equivalent;
(b) Type No. or symbol;
(c) Serial No. and date of manufacture;
(d) Particulars or ratings.

5. TYPE APPROVAL CERTIFICATE CONTENT

(a) Certificate number;
(b) Name and address of manufacturer;
(c) Issue date and validity of certificate / expiry date;
(d) Product description;
(e) Type / model name(s);
(f) Technical specifications, ratings;
(g) List of approval documents;
(h) Approval conditions including limitations, if any.

6. BACKGROUND AND REFERENCE DOCUMENTS

(a) IACS UR E16;
(b) IACS Recommendation 73;
(c) RO Framework Document for the Mutual Recognition of Type Approval

Note: Cable trays/protective casings passing through a hazardous area should be electrically conductive.
## 7. APPROVAL DATE AND REVISION NUMBER

<table>
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<tr>
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<th>Comment</th>
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<td>Accepted by Advisory Board</td>
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