RULES FOR CLASSIFICATION

Ships

Edition January 2017

Part 5 Ship types

Chapter 12 Fishing vessels
FOREWORD

DNV GL rules for classification contain procedural and technical requirements related to obtaining and retaining a class certificate. The rules represent all requirements adopted by the Society as basis for classification.

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CHANGES – CURRENT

This document supersedes the July 2016 edition.
Changes in this document are highlighted in red colour. However, if the changes involve a whole chapter, section or sub-section, normally only the title will be in red colour.

Main changes January 2017, entering into force July 2017

• Sec.2 Hull
  — Sec.2 [3.1.1]: Modification of the formula for minimum thickness has been made.

Editorial corrections

In addition to the above stated changes, editorial corrections may have been made.
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SECTION 1 GENERAL

Symbols

For symbols and definitions not defined in this chapter, refer to Pt.3 Ch.1 Sec.4.

\[ L_{oa} = \text{length overall, in m, taken as the maximum length of the vessel measured parallel to the waterline.} \]

1 Introduction

1.1 Introduction

These rules provide requirements for vessels intended for fishing.

1.2 Scope

The rules in this chapter give requirements for hull strength, systems and equipment, safety and availability, stability and load line and the relevant procedural requirements applicable to fishing vessels.

1.3 Application

1.3.1 The requirements in this chapter are supplementary to those in Pt.2, Pt.3 and Pt.4 applicable for the assignment of main class.

1.3.2 Vessels built in compliance with the relevant requirements in this chapter may be assigned one of the following class notations:

- **Fishing vessel** (see Sec.2 [3])
- **Stern trawler** (see Sec.2 [4]).

1.3.3 Vessels with arrangement in cargo holds for fish in bulk in compliance with the requirements given in Sec.2 [5] may have the qualifier \( S \) added to the class notation given in [1.3.2].

1.3.4 Vessels which satisfy the additional requirements in Sec.6 [1.9] and Sec.6 [2.4] (Norwegian Maritime Authority requirements) may have the qualifier \( N \) added to the class notation given in [1.3.2] and [1.3.3].

1.3.5 Vessels with fish processing spaces/decks and refrigerated holds for frozen fish products may have the class notation \( RM \) added if the refrigeration plant satisfies the requirements given in Pt.6 Ch.4 Sec.10.
2 Class notations

2.1 Ship type notations

Vessels built in compliance with the requirements as specified in Table 1 will be assigned the class notations as follows:

Table 1 Ship type notations

<table>
<thead>
<tr>
<th>Class notation</th>
<th>Description</th>
<th>Qualifier</th>
<th>Additional description</th>
<th>Design requirements, rule reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing vessel</td>
<td>Arranged for fishing as main purpose</td>
<td>&lt;none&gt;</td>
<td>Arranged for carriage of fish in bulk, with shifting boards in cargo holds</td>
<td>Ch.12 Sec.1 to Sec.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ship also complying with the requirements of the Norwegian Maritime Directorate (NMD)</td>
<td></td>
</tr>
<tr>
<td>Stern trawler</td>
<td>Arranged for fishing as main purpose</td>
<td>&lt;none&gt;</td>
<td>Arranged for carriage of fish in bulk, with shifting boards in cargo holds</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ship also complying with the requirements of the Norwegian Maritime Directorate (NMD)</td>
<td></td>
</tr>
</tbody>
</table>

2.2 Additional notations

The following additional notations, as specified in Table 2, are typically also applied to vessels intended for fishing:

Table 2 Additional notations

<table>
<thead>
<tr>
<th>Class notation</th>
<th>Description</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMON</td>
<td>Tailshaft condition monitoring arrangement</td>
<td>All ships</td>
</tr>
<tr>
<td>BIS</td>
<td>Ships built for in-water survey of the ship’s bottom and related items</td>
<td>All ships</td>
</tr>
<tr>
<td>Clean</td>
<td>Requirements for controlling and limiting operational emissions and discharges</td>
<td>All ships</td>
</tr>
<tr>
<td>RM (X°C/Y°C sea)</td>
<td>Equipped with a refrigeration plant where the lowest chamber temperature X is given in °C and maximum sea water temperature Y in °C</td>
<td>All ships</td>
</tr>
</tbody>
</table>
3 Documentation

3.1 Documentation requirements

3.1.1 General
For general requirements to documentation, including definition of the Info codes, see Pt.1 Ch.3 Sec.2.
For a full definition of the documentation types, see Pt.1 Ch.3 Sec.3.

3.1.2 General
Documentation shall be submitted as required by Table 3.

Table 3 Documentation requirements

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural fire protection</td>
<td>G060 - Structural fire protection drawing</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>G061 - Penetration drawings</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Fire water system</td>
<td>S010 - Piping diagram (PD)</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>S030 - Capacity</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z030 - System arrangement plan</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Machinery spaces fixed fire fighting system</td>
<td>G200 - Fixed fire extinguishing system documentation</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Fire detection and alarm system</td>
<td>I200 - Control and monitoring system documentation</td>
<td>If E0 notation is requested</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z030 - System arrangement plan</td>
<td>If E0 notation is requested</td>
<td>AP</td>
</tr>
<tr>
<td>Safety, general</td>
<td>G040 - Fire control plan</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Decks</td>
<td>Z030 - Arrangement plan</td>
<td>Including all fishing equipment (winches, cranes, etc.), doors, hatches, working areas, etc.</td>
<td>FI</td>
</tr>
<tr>
<td>Trawl gallow structure</td>
<td>H050 - Structural drawing</td>
<td>Including hull support, load cases and respective forces</td>
<td>AP</td>
</tr>
<tr>
<td>Winch supporting structures</td>
<td>H050 - Structural drawing</td>
<td>Including design loads, wire loads, footprint loads and shear stoppers</td>
<td>AP</td>
</tr>
<tr>
<td>Crane supporting structures</td>
<td>H050 - Structural drawing</td>
<td>Including design loads and reaction forces</td>
<td>AP</td>
</tr>
<tr>
<td>Bilge water control and monitoring system</td>
<td>I200 - Control and monitoring system documentation</td>
<td>Control of valves and pumps</td>
<td>AP</td>
</tr>
</tbody>
</table>
3.2 Additional stability requirements

3.2.1 Stability information in a simplified form may be accepted as an alternative or supplement to the stability booklet.

Guidance note:
A diagram showing the necessary amount of cargo in hold to comply with the criteria as a function of the percentage of fuel remaining, may be used as simplified stability information.

---end---of---guidance---note---

3.2.2 Operational information shall be given such as general precautions against capsizing and procedures related to severe weather conditions, including precautions to prevent unintentional flooding. This should also include information on safe use of cranes and fishing gear, if relevant.

3.2.3 A drawing of buoyant volumes with their openings and closing appliances shall be included. This drawing shall include instructions on operation of the closing appliances, e.g. to be kept closed at sea.

3.2.4 If any of the closing appliances referred to in Sec.6 [1.2.3] have to be left open periodically during fishing, the opening(s) shall be considered as flooding points in the stability calculations. If the angle of flooding is less than 30°, Sec.6 [1.6.2] applies.

Guidance note:
The internal opening of garbage chute which is operated in such a way that only one of the two required closing devices is open at a time need not be considered as a flooding point. (See Sec.3 [2.1.5] for arrangement of garbage chutes).

---end---of---guidance---note---

4 Testing

4.1 Testing during newbuilding

Testing of insulation materials being part of fire protection of bulkheads and decks shall be carried out in accordance with a recognized standard, e.g. DIN 4102.1 B2 or equivalent.

The test method chosen shall be suitable for the type of foam in question.

5 International regulations

5.1 General requirements

The following international regulations may apply:

— Torremolinos International Convention for the Safety of Fishing Vessels, 1977, amended by Protocol of 1993 as applied by the relevant Flag State Administration for fishing vessels with a length \( L \) larger than 45 m (did not enter into force on an international basis).
— Code on Intact Stability for All Types of Ships Covered by IMO Instruments, Resolution A.749(18), as amended.
— Code for Safety of Fishermen and Fishing Vessels, 2005 IMO.
— Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, 2005 FAO/IL0/IMO.
SECTION 2 HULL

1 Hull arrangement

1.1 Arrangement on deck

1.1.1 Masts, rigging, superstructures, deckhouses and other items on deck on vessels intended for service in Arctic waters shall be so designed and arranged that excessive accumulation of ice is avoided. The rigging shall be kept at a minimum, and the surfaces of superstructures and other erections shall be as even as possible and free from projections and irregularities.

1.1.2 Air pipes from fuel oil tanks shall extend to a deck above freeboard deck or otherwise be protected to prevent seawater from entering the tanks.

Guidance note:
The term *be protected* is meant as arrangement utilising common venting through an overflow tank, or a drain pot in the air pipe with automatic drainage to a suitable tank.

1.2 Forecastle

1.2.1 Fishing vessels shall have a forecastle if the sheer in the forebody is less than 1.5 times standard sheer according to the *International Convention on Load Lines*, 1966.

1.2.2 The length of the forecastle is not to be less than 0.07 $L_{LL}$ m, and the mean height shall not be less than 1.5 m.

1.2.3 The forecastle shall be closed. When the length of the forecastle is greater than 0.07 $L_{LL}$, the surplus part may be open if fitted with freeing ports according to the *International Convention on Load Lines*, 1966.

1.2.4 The required bow height is defined as the vertical distance at the forward perpendicular from the loaded waterline to the top of the exposed deck at side and given by:

$$H_B = 56 L_{LL} \left( 1 - \frac{L_{LL}}{500} \right) C_{B-LL} 0.68$$

where:

$C_{B-LL}$ = block coefficient at loaded waterline or 0.5 if $C_{B-LL}$ is not known.

1.3 Refrigerated sea water tanks for fish

1.3.1 Refrigerated sea water (RSW) tanks for transportation of fish shall be designed for relevant pressure heads in accordance with the rules.

1.3.2 Where an internal skin is fitted and the gap between skin and hull structure is filled with insulation of an approved type, this skin shall be welded continuously to every other frame/stiffener and slot-welded to the intermediate one. The skin plate shall be made continuous with good end connections and should not be terminated abruptly. An effective flange width in mm, may be included when calculating the section modulus of strength members:
where:

\[ b_{eff} = 40 \cdot t_{gr} \]

\[ t_{gr} = \text{skin gross thickness, in mm, not to be less than 5 mm.} \]

1.3.3 The strength of the lining plate shall satisfy:

1) the requirement to local strength of bulkhead plate as given in Pt.3 Ch.6 Sec.4 [1] (hull girder longitudinal stress need not to be included), or

2) the space between the lining and the bulkhead plate is filled with a foam with sufficient strength and stiffness to carry the lining plate without permanent set. The actual design tank pressure shall be used as strength criteria for the foam. The yard has the responsibility for appropriate selection and application of the foam.

1.3.4 The insulation material shall have good adhesion to steel and suitable strength characteristics, e.g. polyurethane foam. The steel surface shall be corrosion protected before it is insulated.

1.3.5 Corrugated bulkheads shall be supported along both bulkhead flanges in the bottom structure with sufficient connections to crossing members. Carlings shall be fitted in way of corners in corrugations and ends of unstiffened plate panels.

At lower end of the corrugated bulkheads, brackets aligned with the corrugation webs shall be arranged underneath.

2 Design requirements

2.1 General requirement

2.1.1 The wall thickness of the steel plates between hull plating and closeable non-return valve shall not be less than 12.5 mm. However, if possible to get access for inspection and maintenance the thickness can be reduced to 10 mm.

2.2 Draught for scantlings

2.2.1 For fishing vessels for which the draught is not limited by any freeboard mark, the moulded depth \( D \) instead of draught \( T \) shall be used when calculating the scantlings of strength members.

2.3 Cargo hold bulkheads

2.3.1 The cargo hold bulkheads may be classified as follows:

Type A: Bulkheads in cargo holds intended for dry cargo.

Type B: Bulkheads in cargo holds intended for fish in bulk.

Type C: Bulkheads in cargo holds intended for liquids (for instance RSW-tanks, sludge etc.).
2.3.2 The strength of the different bulkhead types shall comply with the requirements given in:
For **Type A**: Pt.3 Ch.6 - Watertight bulkheads.
For **Type B**: [5]
For **Type C**: Pt.3 Ch.6 - Tank bulkheads.

2.4 Pillars

2.4.1 Pillars acting as supports for deck loadings shall be permanently connected at top or bottom. If the connections are arranged with bolts these bolts shall be secured by welding.

2.4.2 Pillars acting as supports for shifting boards only may have ordinary bolt connections.

2.5 Bulwarks

2.5.1 The thickness of bulwark plating shall not be less than 80% of rule thickness of side shell plating, and minimum 6 mm.

2.5.2 Bulwark stays shall be fitted at every 2nd frame.

3 Local scantlings for notation fishing vessel

3.1 Additional requirements

3.1.1 The net thickness, in mm, of bottom and side shell plating up to a height 2 m above loaded waterline shall not be less than:

\[ t = \min((4 + 0.06L)\sqrt{k}; 8.0) \]

4 Local scantlings for notation stern trawler

4.1 Additional requirements

4.1.1 The net thickness, in mm, of bottom and side shell plating up to a height 2 m above loaded waterline shall not be less than:

\[ t = \min((4 + 0.04L)\sqrt{k} + 0.5 ; 8.5) \]

4.1.2 The net thickness, in mm, of trawl ramp and adjacent side plating, stern and side plating abaft the point where the trawling boards are normally taken on board, shall not be less than:

\[ t = \max((5 + 0.12L)\sqrt{k} + 0.5 ; 10.5) \]

4.1.3 Between trawl gallows the bulwark plating shall have the same thickness as the side shell plating, and bulwark stays shall be fitted at every frame.

4.1.4 Where bulwarks, sheer strake, side shell and transom plating are particularly exposed to blows and chafing, steel rubbing pieces shall be fitted, consisting of minimum 75 × 37 mm half-round bars or equivalent.
4.1.5 The gross section modulus, in cm$^3$, of stiffeners in the trawl ramp shall not be less than:

$$Z_{gr} = 15 \ell_{bdg}^2 \cdot s \cdot k$$

5 Cargo holds for fish in bulk - bulkhead arrangement and strength

5.1 General requirements

5.1.1 Assumptions
The rules in this section are based on the assumptions that:
— during loading in vessels having one longitudinal bulkhead, the level of cargo at any time will be approximately the same on both sides of the bulkhead
— cargo not carried in tanks, is drained before loading
— cargo holds fully loaded with fish treated with preserving agent, are checked regarding swelling.

5.2 Location of bulkheads

5.2.1 Longitudinal watertight bulkheads are normally to be arranged as follows:
$B \leq 6$ m: One centre line bulkhead
$B > 6$ m: Two bulkheads

5.2.2 Longitudinal bulkheads shall be positioned symmetrically about the ship's centre line.

5.2.3 Transverse bulkheads in cargo holds are normally not to be spaced more than $0.15 L$ apart. The spacing need not be taken less than 9 m and is not to exceed 12 m.

5.3 Design load conditions

5.3.1 If there is one longitudinal centre line bulkhead a loading condition as defined in [5.1.1] is assumed.

5.3.2 If there are two or more longitudinal bulkheads, these shall be designed for one-sided loading.

5.3.3 Transverse bulkheads shall be designed for one-sided loading.
5.4 Longitudinal bulkheads with vertical wooden boards

5.4.1 In hatch openings in which vertical wooden boards are used, a steel stiffener shall be fitted at each side of the bulkhead top, and if necessary also half way up the bulkhead. The gross section modulus of the longitudinal stiffeners in accordance with [5.4.2] is given on the assumption that stiffeners on each side of the bulkhead are connected to each other at 1/4 and 1/2 span. For area of connection, see [5.7.9]. If the stiffeners are not connected to each other, the section modulus according to [5.4.2] is doubled.

5.4.2 The gross section modulus, in cm$^3$, of each steel stiffener shall not be less than:

$$Z_{gr} = \max\left\{ \frac{s + 3}{6} \cdot k \cdot b \cdot h^2 \cdot \ell^2 ; 40 \right\}$$

where:

\begin{align*}
    b & = 1.2 \text{ for one longitudinal bulkhead} \\
    b & = 1.6 \text{ for two or more longitudinal bulkheads} \\
    h & = \text{height of bulkhead, in m} \\
    \ell & = \text{distance between supports of steel stiffeners, in m} \\
    s & = \text{greatest transverse distance between bulkheads or between bulkhead and ceiling at side, in m.}
\end{align*}

5.4.3 When steel stiffeners are fitted at both the top and half height of the bulkhead, the gross section modulus, in cm$^3$, of the steel stiffeners shall not be less than:

Upper stiffeners:

$$Z_{gr} = 0.4 \cdot h^2 \cdot \ell^2 \cdot k$$

Middle stiffener:

$$Z_{gr} = \frac{s + 3}{6} \cdot k \cdot b \cdot h^2 \cdot \ell^2$$

where:

\begin{align*}
    b & = 1.6 \text{ for one longitudinal bulkhead} \\
    b & = 2.2 \text{ for two or more longitudinal bulkheads.}
\end{align*}

Remaining symbols as given in [5.4.2].
5.4.4 When there is one longitudinal bulkhead, the wooden board thickness, in mm, shall not be less than:

— Without steel stiffener at mid-height:

\[ t_w = 31h \]

— With steel stiffener at mid-height and at bulkhead top:

\[ t_w = \max\{10h + 35 ; 63\} \]

where:

\[ h = \text{bulkhead height, in m.} \]

When there are two or more longitudinal bulkheads, the thickness, in mm, of wooden boards shall not be less than:

\[ t_w = \max\{22 \ell \sqrt{h} ; 76\} \]

where:

\[ \ell = \text{greatest span between supports, in m} \]

\[ h = \text{bulkhead height, in m.} \]

5.4.5 When there are two or more longitudinal bulkheads, the thickness, in mm, of wooden boards shall not be less than:

\[ t_w = \max\{22 \ell \sqrt{h} ; 76\} \]

where:

\[ \ell = \text{greatest span between supports, in m} \]

\[ h = \text{bulkhead height, in m.} \]

5.4.6 In hatch openings a channel section or similar shall be fitted over the top of the bulkhead to prevent the boards from floating away from the bulkhead. If the channel section is supported by the hatchway beams, these shall be secured to the hatch coamings.

5.4.7 The depth of guides for vertical boards shall be at least 100 mm below the deck and at the bottom. The minimum thickness of the section or plate which forms the guide shall be 10 mm. The clearance in the longitudinal direction of the boards shall be as small as possible.

5.4.8 Guide bars shall have a continuous weld connection to the deck and bottom structure, see [5.7.4]. In way of hatches the bottom guides shall be stiffened with tripping brackets maximum 2 frame spaces apart. Guide bars bedded in concrete shall be fastened to the ship’s bottom structure. If this is not feasible, the guide bars shall be securely fastened in the concrete.

5.5 Longitudinal bulkheads with horizontal wooden boards

5.5.1 The distance between vertical uprights, i.e. steel supporting beams, or permanent transverse bulkheads and uprights is normally not to be greater than 2.0 m and is in no case to exceed 2.25 m.

5.5.2 If there is one longitudinal bulkhead, the gross section modulus, in cm³, of uprights is not to be less than:
\[ Z_{gr} = \max\{0.5(s + 3)h^3 \cdot b \cdot k ; 40\} \]

where:
\[ h \quad = \quad \text{free span of upright, in m} \]
\[ b \quad = \quad \text{distance between uprights, in m} \]
\[ s \quad = \quad \text{greatest transverse distance between bulkheads or between bulkhead and ceiling at side, in m}. \]

5.5.3 If there are two or more longitudinal bulkheads, the gross section modulus, in cm\(^3\), of uprights shall not be less than:
\[ Z_{gr} = \max\{5.0h^3 \cdot b \cdot k ; 40\} \]

where:
\[ h \quad = \quad \text{free span of upright, in m} \]
\[ b \quad = \quad \text{distance between uprights, in m}. \]

5.5.4 The uprights shall be secured at top and bottom so that the reaction forces are distributed to adjacent structures.

5.5.5 If openings are cut in the uprights for the entering of the upper boards, the boards in the opening shall be locked in position to prevent their slipping out of the guide.

5.5.6 Permanent pillars for hatch end beams or transverses which also serve as guides for shifting boards or removable bulkheads in steel ships shall have extra stiffening with brackets at the top. For scantlings of pillars, see [5.5.3] and [5.5.4].

5.5.7 The wooden board gross thickness, in mm, shall not be less than:
\[ t_w = (b \cdot \ell \cdot \sqrt{h} ; t_{\min}) \]

where:
\[ t_{\min} = 76 \text{ mm for } h \geq 1.9 \text{ m} \]
\[ t_{\min} = 63 \text{ mm for } h < 1.9 \text{ m} \]
\[ b = 20 \text{ for one longitudinal bulkhead} \]
\[ b = 24 \text{ for two or more longitudinal bulkheads} \]
\[ h = \text{bulkhead height, in m} \]
\[ \ell = \text{distance between uprights, in m}. \]

5.5.8 Supporting guides for wooden boards in stiffeners or uprights shall be at least 75 mm deep and made of plates or sections of at least 10 mm thickness. If the sections do not comply with the requirements to groove depth or breadth for bulkhead boards, a flat bar (or similar) shall be welded to the flange of the section and the breadth may be adjusted by inserting a lining into the groove.

5.5.9 Bulkheads shall extend to the deck. Between beams, the spaces above bulkheads shall be packed with filling pieces such as steel plates which shall run down the side of the uppermost board and be fastened to this.
5.6 Transverse bulkheads with vertical wooden boards

5.6.1 When horizontal steel stiffeners are fitted at half height of the bulkhead, the gross section modulus, in cm$^3$, of the steel stiffener shall not be less than:

$$Z_{gr} = \max\{2.6h^2 \cdot \ell^2 ; 40\}$$

where:

- $h$ = bulkhead height, in m
- $\ell$ = distance between supports, in m.

5.6.2 In exceptional cases the horizontal stiffener may be fitted on the hold side. A 100 x 12 mm flat bar is then to be fitted on the other side of the bulkhead. The bar is bolted to the horizontal stiffener with bolts spaced not more than 200 mm. The gross sectional area, in cm$^2$, of the bolts at bottom of threads shall not be less than:

$$A_{gr} = 1.2h^2 \cdot b$$

where:

- $h$ = bulkhead height, in m
- $b$ = bolt spacing, in m.

Minimum bolt diameter is 16 mm.

5.6.3 The horizontal stiffener is fastened to frames etc. with bolts of which at least 2 on each side shall be through bolts. The total gross sectional area, in cm$^2$, of the bolts at bottom of threads at each end shall not be less than:

$$A_{gr} = 0.6h \cdot \ell$$

where:

- $h$ = bulkhead height, in m
- $\ell$ = span of stiffeners, in m.

Minimum bolt diameter is 16 mm.
5.6.4 The wooden board thickness, in mm, shall not be less than:

\[ t_w = \max\{25 \cdot \ell \cdot \sqrt{h} ; t_{\text{min}}\} \]

where:

- \( t_{\text{min}} = 76 \text{ mm for } h \geq 1.8 \text{ m} \)
- \( t_{\text{min}} = 63 \text{ mm for } h < 1.8 \text{ m} \)
- \( \ell = \) greatest span between supports, in m
- \( h = \) bulkhead height, in m.

5.6.5 For details, see [5.5.4], [5.5.5], [5.5.6], [5.5.8] and [5.5.9].

5.7 Transverse bulkheads with horizontal wooden boards

5.7.1 The gross section modulus, in cm\(^3\), of uprights shall not be less than:

\[ Z_{gr} = \left( \max 5.3 h^3 \cdot b \cdot k ; 40 \right) \]

where:

- \( h = \) free span of upright, in m
- \( b = \) distance between uprights, in m.

5.7.2 The board thickness, in mm, shall not be less than:

\[ t_w = \max\{27 \cdot \ell \cdot \sqrt{h} ; t_{\text{min}}\} \]

where:

- \( t_{\text{min}} = 76 \text{ mm for } h \geq 2.0 \text{ m} \)
- \( t_{\text{min}} = 63 \text{ mm for } h < 2.0 \text{ m} \)
- \( h = \) bulkhead height, in m
- \( \ell = \) distance between uprights, in m, maximum 2.0 m.

5.7.3 For details, see [5.5.4], [5.5.5], [5.5.6], [5.5.8] and [5.5.9].

5.7.4 The gross total area of attachment, e.g. bolts, in cm\(^2\), at the lower end of removable uprights shall not be less than:

\[ A_{gr} = 0.9 \cdot h^2 \cdot b \]

where:

- \( h = \) bulkhead height, in m
- \( b = \) distance between uprights, in m.

Minimum bolt diameter is 16 mm.
5.7.5 The gross sectional area at bottom of threads per bolt for bolted bulkheads shall be determined according to the formula in [5.7.4] when:

\[ b = \text{bolt spacing, in m.} \]

Minimum bolt diameter 16 mm.

5.7.6 The gross area of attachment at the top for single deck vessels can be 60% of the area stipulated in [5.7.4] and [5.7.5].

5.7.7 All welds for the securing of bulkheads and uprights shall be of the double continuous type.

5.7.8 If a U-shaped collar is fitted around beams and keelson and secured with horizontal through bolts, the gross area of these bolts can be 60% of the area stipulated in [5.7.4] and [5.7.5].

5.7.9 The total gross area of connection between horizontal stiffeners, in cm\(^2\), mentioned in [5.4.1], shall not be less than:

\[ A_{gr} = 1.05 \cdot h^2 \cdot \ell \]

where:

\[ h = \text{bulkhead height, in m} \]
\[ \ell = \text{distance, in m, between support of stiffeners} \]

5.8 Permanent steel bulkheads

5.8.1 The gross section modulus, in cm\(^3\), of stiffeners on permanent longitudinal or transverse bulkheads shall be at least:

\[ Z_{gr} = \max \left( b \cdot \ell^2 \cdot s \cdot h ; 15 \right) \]

where:

\[ b = 3.75 \text{ for one longitudinal bulkhead} \]
\[ = 4.5 \text{ for transverse bulkheads} \]
\[ = 4.5 \text{ for 2 or more longitudinal bulkheads} \]
\[ \ell = \text{stiffener span, in m} \]
\[ s = \text{stiffener spacing, in m} \]
\[ h = \text{height, in metres from midpoint, of stiffener span to top of bulkhead or hatch coaming} \]

5.8.2 The stiffener's gross moment of inertia, in cm\(^4\), shall not be less than:

\[ I_{gr} = 2.2 \cdot Z_{gr}^{3/4} \]

where:

\[ Z_{gr} = \text{as given in [5.8.1], with } k = 1.0. \]
5.8.3 Permanent pillars which are welded to permanent bulkheads and also serve as guides for removable bulkheads in way of hatches shall have scantlings as given in [5.8.1] and [5.8.2], when \( s \) = breadth of load surface in m. Remaining symbols as under [5.8.1].

5.8.4 The plate thickness in permanent steel bulkheads shall be as given in [5.9.2].

5.8.5 Corrugated bulkheads will be accepted provided their strength is equivalent to that of plane bulkheads.

5.8.6 Stiffeners shall be fitted with brackets at both ends. The brackets are not to terminate on unstiffened plating or over a scallop.

Care shall be taken, particularly at the bottom, that the corners of the corrugations do not end on unstiffened plating.

5.8.7 The various structural parts shall be connected by welding in accordance with the requirements for watertight bulkheads.

5.9 Removable bulkheads of steel or aluminium

5.9.1 Removable steel or aluminium bulkheads which are used in connection with hatches shall be double plated with the stiffeners placed horizontally. Internal surfaces of steel bulkheads shall be covered by a corrosion-resistant coating.

5.9.2 The gross plate thickness, in mm, of removable bulkheads shall not be less than:

\[
\begin{align*}
t_{gr} &= \max\left(3.4s\sqrt{h} / k + 1.5 ; \ 6\right) \\
\text{Steel:} \\
t_{gr} &= \max\left(4.7s\sqrt{h} + 1.5 ; \ 6\right) \\
\text{Aluminium:}
\end{align*}
\]

where:

\( s \) = stiffener spacing, in m

\( h \) = height, in m, from upper edge of bulkhead to lower edge of plating.

5.9.3 The gross section modulus of horizontal stiffeners, in cm\(^3\), shall not be less than:

\[
\begin{align*}
Z_{gr} &= 7.0 \cdot t^2 \cdot s \cdot h \cdot k \\
\text{Steel:} \\
Z_{gr} &= 13.5 \cdot t^2 \cdot s \cdot h \\
\text{Aluminium:}
\end{align*}
\]

\( t, s \) and \( h \) are given in [5.8.1].

5.9.4 For aluminium materials with a guaranteed 0.1% tensile proof stress (\( \sigma_{0.1} \)) which exceeds 120 N/mm\(^2\), the requirement to \( Z_{gr} \) can be reduced in direct proportion.

If however, the material’s guaranteed \( \sigma_{0.2} \) value is greater than 70% of the guaranteed ultimate tensile strength, the lower value shall be used as a basis for scantlings.

5.9.5 The gross moment of inertia of stiffeners, in cm\(^4\), shall not be less than:
\[ I_{gr} = C \cdot Z_{gr}^{-\frac{4}{3}} \]

where:

\[ C = \begin{cases} 2.2 \text{ for steel} \\ 5.75 \text{ for aluminium} \end{cases} \]

\[ Z_{gr} = \text{as given in [5.9.3] for steel, with } k = 1.0. \]

**5.9.6** When welding aluminium, attention should be paid to the reduced strength of the material in the weld area, and the weld should, where practicable, be positioned in less stressed areas.

**5.9.7** Guides for removable bulkheads shall have brackets at 1 m spacing. The depth of the support at the sides of removable bulkheads shall be at least equal to the bulkhead thickness, and not less than 65 mm. The minimum thickness of sections or plates which form the guides, is 10 mm.

**5.9.8** In order to prevent galvanic corrosion, insulation shall be fitted at connections or contact surfaces between steel and aluminium.

**5.9.9** If necessary, removable bulkheads shall be equipped with a securing arrangement for preventing the bulkhead from floating.

Slot welding is carried out against a 50 × 8 mm steel flat bar or equivalent.

Removable aluminium bulkheads are presumed constructed of a sea-water resistant alloy.

**5.10 Corrugated aluminium sections**

**5.10.1** Corrugated aluminium shifting boards may be used instead of horizontal wooden boards. The maximum length, in m, between supports shall not be greater than:

\[ \ell_{max} = \frac{m}{m} \left( K \cdot \frac{h^2}{b} \right)^{\frac{1}{3}} \]

where:

\[ m = \begin{cases} 0.6 \text{ for one longitudinal bulkhead} \\ 0.5 \text{ for 2 or more longitudinal bulkheads} \\ 0.4 \text{ for transverse bulkheads} \end{cases} \]

\[ h = \text{bulkhead height, in m} \]

\[ b = \text{board breadth, in m} \]

\[ I_A = \text{gross moment of inertia of board, in cm}^4. \]

**5.10.2** In order to prevent galvanic corrosion, insulation shall be fitted at connections or contact surfaces between steel and aluminium.

**5.10.3** The corrugated boards shall be made of seawater resistant aluminium.

**5.10.4** For details the same rules apply as for bulkheads with horizontal wooden boards.
SECTION 3 SYSTEMS AND EQUIPMENT

1 Bilge and drainage arrangement

1.1 Cargo holds for fish in bulk

1.1.1 There shall be good drainage for water, oil or brine from the cargo. Trunks and gutters shall be located such that they at all times will provide good drainage from all layers of the cargo, throughout the hold.

1.1.2 In each bin there shall be drainage to a bilge well through vertical drainage trunks of perforated plates, grating, etc. as specified in Table 1.

The minimum acceptable perforated circumference per trunk is 0.3 m. The perforations shall consist of 4-8 mm holes or equivalent.

Table 1 Drainage arrangement

<table>
<thead>
<tr>
<th>Area in $m^2$ of bin below deck</th>
<th>Minimum number of drainage trunks per bin</th>
<th>Total length in m of trunk perforated circumference per bin</th>
</tr>
</thead>
<tbody>
<tr>
<td>A &lt; 10</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>10 ≤ A &lt; 15</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>15 ≤ A &lt; 20</td>
<td>3</td>
<td>1.2</td>
</tr>
<tr>
<td>20 ≤ A &lt; 25</td>
<td>4</td>
<td>1.4</td>
</tr>
<tr>
<td>25 ≤ A &lt; 30</td>
<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td>30 ≤ A &lt; 35</td>
<td>5</td>
<td>1.8</td>
</tr>
</tbody>
</table>

1.1.3 Each cargo hold shall have a bilge well at its after end. If the length of the watertight compartment exceeds 9 m, there shall be a bilge well also at the forward end.

Each bilge well shall have a volume not less than 0.15 $m^3$.

1.1.4 From each bilge well, a separate branch suction line shall be led to the engine room. The bilge distribution valves shall be of screw-down non-return type. All valves shall be fitted in readily accessible positions.

1.1.5 The valve chest collecting branch suction lines from cargo holds for fish in bulk shall have no connections from dry compartments. The valve chest shall be directly connected to the largest bilge pump. In addition, a connection shall be provided to another bilge pump.

1.1.6 The internal diameter of the branch suction lines shall be as required in Pt.4 Ch.6 for main bilge lines. Minimum diameter 50 mm.

1.1.7 Means for back-flushing bilge suctions shall be provided. The connecting of water supply for back-flushing shall be by portable means, e.g. hose.

1.2 Tanks for fish in refrigerated sea water tanks (RSW-tanks)

1.2.1 The RSW-tanks shall have a pumping system for filling and emptying of seawater. The system shall have pipe dimensions complying with the requirements for ballast systems.
1.2.2 If the tanks are also to be used for carrying dry cargo, the tanks shall be arranged with a bilge system. If the tanks shall be used for carrying fish in bulk, the requirements given in [1.1.3] and [1.1.4] are also to be complied with.

1.2.3 Where RSW-tanks are also arranged for carrying dry cargo, blank flanging or two closable valves in series to avoid ingress of water from RSW system to the bilge system are required.

1.3 Tween deck for fish in bulk

1.3.1 Fishing vessels intended for carrying fish loose on tween deck shall have a satisfactory arrangement for drainage of tween deck. The drainage may be led to bilge well in the hold below or arranged as given in [1.1.4] to [1.1.7].

1.3.2 For tween deck compartments having no openings where sea may penetrate and where no processing requiring supply of water is taking place, drainage to bilge will in the engine room may be accepted. The drainage pipes are normally not to exceed 50 mm in diameter and shall have a self-closing valve at the engine room side.

1.3.3 For combination vessels, i.e. longline, net fishing, etc. an efficient drainage system shall be provided for all weathertight divisions/compartments in addition to the drainage from tween deck.

1.4 Engine room bilge water monitoring

Alarm for high level in bilge wells in engine room shall be installed on the bridge.

2 Prevention of tween deck flooding

2.1 Arrangement of side openings leading to tween deck (working deck)

2.1.1 Arrangement and closing appliances of openings in side which will normally be open when the vessel is at the fishing grounds, shall be in accordance with [2.1.2] to [2.1.5].

2.1.2 Doors in vessel's side and stern shall be limited in size and number to the minimum possible. The sill height is normally not to be less than 1000 mm. The doors with securing devices shall be designed with a strength equivalent to the structure in which they are fitted, and shall be so arranged that weathertight quick closing (approximately 15 second for side doors), can be easily executed by one member of the crew without the use of tools. This shall be possible also during black-out.

If arranged with remote closing from the bridge, a signal light shall be fitted at the port(s), warning automatically when closing is executed. To avoid injury when closing, TV monitoring of the door(s) or means of communication according to Sec.4 [1.1.2] shall be arranged.

Signboard with the following text to be fitted: "To be kept closed when not in use during fishing".

2.1.3 Each opening for drainage by pumps from drainage wells shall be fitted with a type approved automatic non-return flap with manual means of closing operable from 1.5 m above the deck. The inboard opening shall be situated not lower than 0.02\(L_{oa}\), or minimum 0.7 m above the maximum loaded waterline.

2.1.4 Drainage flaps leading directly overboard from drainage wells shall be limited to the minimum possible in size and number, and shall be flush with hull to avoid damage. Drainage flaps shall have vulcanised surfaces and be easy to flush clean. Drainage flaps shall be easily accessible for cleaning and survey. Remote closing from the bridge shall be arranged in addition to manual means of closing operable from 1.5 m above the deck. A panel on the bridge shall show which flaps are open/closed.
2.1.5 Inboard openings of garbage chutes for disposal of fish waste, shall be located minimum 0.7 m above the maximum loaded water line. The inboard end shall be fitted with a weathertight hinged cover and necessary number of securing devices. The outboard end shall be fitted with a watertight closeable non-return valve operable from 1.5 m above deck. The arrangement shall be easy to flush clean, and be easily accessible for survey.

2.2 Drainage of tween deck with openings in side

2.2.1 Tween deck with openings according to [2.1.1] shall be arranged with a drainage system in accordance with [2.2.2] to [2.2.7].

2.2.2 Drainage shall be carried out using separate pumps in drainage wells at side at the lowest position of the working deck. For vessels with a working deck of length greater than 9 m, drainage wells shall be fitted forward and aft. For working decks of length greater than $B/2$, drainage wells shall be fitted on both sides.

2.2.3 The volume of each drainage well shall not be less than:

$$V = 0.5 \cdot A_s \cdot \ell \cdot B$$

where:

- $V$ = volume of drainage well, in dm$^3$
- $A_s$ = area of the side port(s) at each side, in m$^2$
- $\ell$ = length of working deck in m.

The volume shall in no case be less than 0.15 m$^3$, and the depth of each well shall be at least 0.35 metres.

2.2.4 The arrangement of drainage wells shall provide for effective drainage and avoidance of clogging by fishing hooks and fish waste of pump suction.

2.2.5 The capacity of each bilge pump, in m$^3$/h, shall not be less than:

$$Q_{\text{max}} = \left\{ 3B \cdot A_s; Q_{\text{min}} \right\}$$

where:

- $Q_{\text{min}} = 1.25$ times available wash-down capacity in m$^3$/h, for each side.

2.2.6 Bilge pumps shall be fitted with manual start/stop, and be designed to pump fish waste together with drainage water. Outlet shall be in accordance with [2.1.3].

2.2.7 Alarm for free water on tween (working) deck shall be installed on the bridge. The alarm shall be activated when the drainage wells are full.

2.2.8 In addition to the arrangement described in [2.2.2] to [2.2.7], drainage flaps according to [2.1.4] may be installed in the drainage wells if necessary. The freeboard shall not be less than to the lower edge of the drainage flap opening, or 0.35 m measured from the deck.
2.3 Arrangement of openings from tween deck to other spaces

Closing appliances for openings from tween deck to spaces below deck, or to closed superstructure which is considered buoyant in the stability calculations, shall be in accordance with Sec.6 [2.2.6].

3 Enclosed tween deck

3.1 Enclosed tween deck where water is used in processing

3.1.1 Any arrangement of garbage chutes shall be in accordance with [2.1.5].

3.1.2 Drainage from drainage wells shall be carried out by pumps. If the arrangement is based on separate pumps situated in each drainage well as in [2.2.1] to [2.2.7], the outlet shall be in accordance with [2.1.3]. The number and location of drainage wells shall be arranged so that satisfactory drainage is achieved. The capacity of drainage pumps shall be at least 1.25 times available wash-down capacity in m³/h, for each side.

4 Spaces with refrigeration installations of direct expansion type

4.1 Refrigeration plant

The refrigeration machinery room and the refrigeration system shall comply with the requirements in Pt.4 Ch.6 Sec.6.

4.2 Refrigerated holds for stowage of frozen fish/fish products

4.2.1 Access/exits

In holds where personnel may be engaged in stowing frozen fish products, the exit(s) shall be arranged so that escape is easy, preferably by inclined stairs. The escapeway(s) shall be suited for carrying a disabled person out of the hold.

Cooled/frozen cargo chambers with direct expansion air coolers and with vertical access, if they are normally manned such as on fishing vessels and on fish factory ships, shall be fitted with permanent hoisting arrangements for removal of injured/unconscious crew members.

Exit doors shall open outwards.

In case Ammonia (R717) is the refrigerant, gas masks shall be placed close to the normal access to the hold. If the normal exit from the hold is through a space containing refrigeration equipment, e.g. fish processing space, gas masks shall be available from inside the hold enabling personnel to escape. Alarm signals, optical and audible, shall be fitted inside the hold giving warning in case of refrigerant leakage in the adjacent space.

Access doors and hatches shall either be operable from both sides or be fitted with catches to prevent inadvertent closing.

If air pipes for tanks or sea chests and water pipes are passing through freezing chambers or its insulation, they shall be arranged to prevent freezing.

All holds and air cooler rooms are each to be fitted with at least one conveniently located alarm call button.

4.2.2 Refrigerant leakage detection

A refrigerant leakage detection system shall be fitted. For refrigerants in group 1, except CO₂, an oxygen deficiency monitoring may be accepted in lieu of refrigerant gas detection.
In case the refrigerant is ammonia or CO₂, gas leakage detection shall be fitted. Alarm shall be triggered as follows:

Ammonia (R717) : 150 PPM
CO₂ (R744) : 2000 PPM.

The detectors shall be suitable for use in the low temperature environment and shall be calibrated for same.

4.2.3 Ventilation
Arrangements for mechanical ventilation of the hold in case of a refrigerant leakage shall be available. The ventilation may be either fixed or portable type.

4.3 Fish processing decks/spaces

4.3.1 Access/exits
At least two exits from the space shall be provided. If R717 is the refrigerant the location of the exits shall be such that a possible refrigerant leakage will not block access to both exits.
The normally used access/exits shall have outward opening doors.

4.3.2 Ventilation
The normal ventilation shall be separate for the space and may be natural or mechanical.
Mechanical ventilation shall be of extraction type.
If R717 or R744 being the refrigerant, additional mechanical ventilation shall be available in case of leakage is detected. The ventilation capacity shall be at least 6 air changes per hour.
Starting of additional ventilation shall be automatically initiated in case a refrigerant leakage is detected. Ventilation outlets shall be located away from ventilation inlets to other spaces and away from areas where personnel is normally present.
The emergency stop arrangements for fans required by rules Pt.4 Ch.8 Sec.2 [8.6.2] shall be separate for the fans.

4.3.3 Refrigerant leakage detection
Refrigerant gas detection shall be fitted. Detectors should be located at ventilation suction points and at suitable locations within the space. A minimum of 2 detectors per space is required. Alarm signals, optic and audible, shall be located within the space and in way of accesses to the space.
When R717 is used, refrigerant leakage shall be detected at three different consecutive levels with set points not higher than:

150 ppm : Initia leakage detection
350 ppm : Start ventilation and evacuate the space
5000 ppm : De-energize non-Ex protected electrical equipment, stop refrigerant circulation pumps and close refrigerant supply and return valves required by Pt.4 Ch.6 Sec.6 [4.2.2]

Separate alarm indication in the navigation bridge shall be fitted.
If the refrigerant is CO₂ (R744) alarm, automatic starting of ventilation and closing of refrigerant supply and return valves shall be executed at a concentration of 2000 ppm.
For refrigerants in group 1 except R744 oxygen deficiency alarm may be accepted as alternative to refrigerant gas detection.
4.3.4 Electrical equipment
If R717 is used as refrigerant all electrical equipment shall be Ex certified or arranged for automatic de-energizing in case leakage is detected as specified under [4.3.3]. Emergency lighting in the space and ventilation fan motors shall be Ex-certified and the fans of non-sparking design.

4.3.5 Personnel protection
In case R717 is the refrigerant the following shall be provided:
— gas masks and hermetically sealed filters shall be available in a glass door case located outside each entrance to the space
— outside all access doors water screens and eye washes shall be provided. The water screens/eye washes shall be operable also under freezing conditions.
SECTION 4 FIRE SAFETY AND LIFESAVING APPLIANCES

1 Design requirements

1.1 Internal communications

1.1.1 A general emergency alarm system shall be provided on all fishing vessels and stern trawlers.

1.1.2 If the tween deck is fitted with side openings, two-way voice communication, fixed or portable, shall be provided between the bridge and in way of the doors in the vessel’s side and stern. Alternatively, TV monitoring may be provided.

1.1.3 For electrical requirements refer to Pt.4 Ch.8 Sec.2.

2 Fire safety

2.1 Application

2.1.1 Fishing vessels of less than 500 gross tonnage (according to IMO’s International Convention on Tonnage Measurements of Ships, 1969) or less than 45 m length, \( L_{LL} \) shall comply with the requirements for cargo ships given in Pt.4 Ch.11 Sec.2 and to [2.5.3] and [2.5.4].

2.1.2 Fishing vessels of 500 gross tonnage (according to IMO’s International Convention on Tonnage Measurements of Ships, 1969) and above, or 45 m length, \( L_{LL} \), and above shall comply with the requirements specified in Sec.1 [3.1], and [2.2] to [2.7].

2.1.3 Vessels complying with the fire safety requirements applicable for a new vessel in Torremolinos International Convention for the Safety Of Fishing Vessels 1977, as modified by the Torremolinos Protocol of 1993, or equivalent standards such as the Council Directive 97/70/EC of 11 December 1997 as amended, (setting up a harmonised safety regime for fishing vessels of 24 meters in length and over) or national regulations, need not comply with the requirements referred to in [2.1.1] and [2.1.2] above.

2.2 Fire pumps and water distribution system

Fire pumps and water distribution systems shall comply with the requirements in SOLAS Ch. II-2 Reg. 10.2 as applicable for cargo ships.

2.3 Fire safety arrangement in machinery spaces

2.3.1 The arrangement of fixed total flooding extinguishing system and fire-extinguishing appliances in machinery spaces shall comply with the requirements in SOLAS Ch. II-2 Reg. 10.5 as applicable for cargo ships. Local application system according to Reg. 10.5.6 will not be required.

2.3.2 Escape arrangements in machinery spaces shall comply with the requirements of SOLAS Ch. II-2 Reg. 13.4.2. This will be reviewed in connection with approval of the structural fire protection plan.

2.3.3 Detection in periodically unattended machinery spaces will only be reviewed if the class notation E0 is requested.
2.4 Fire-fighter’s outfits
Fishing vessels shall be provided with at least two sets of fire-fighter’s outfits complying with SOLAS Ch. II-2 Reg. 10.10.

2.5 Fire protection of bulkheads and decks

2.5.1 Structural fire protection shall comply with the requirements in SOLAS Ch. II-2 Reg. 9.2 as applicable for cargo ships. Method of protection as defined in Reg. 2.3.1 should be IC.

2.5.2 Materials shall comply with the requirements in SOLAS Ch. II-2 Reg. 5.3 and 6 as applicable for cargo vessels.

2.5.3 Combustible insulation materials are accepted in compartments for stowage of fish provided low ignitability and low flame spread properties are documented. See Sec.1 [4.1] for testing requirements.

2.5.4 Combustible insulation as accepted by [2.5.3] shall be protected by close-fitting cladding. Acceptable cladding is steel sheet and marine plywood. Surface coatings shall have low flame spread properties.

2.6 Portable fire extinguishers
Portable fire extinguishers shall be provided in accordance with the requirements in SOLAS Ch. II-2 Reg. 10.3 as applicable for cargo ships.

2.7 Fire control plan
Fire control plans shall be provided as to comply with the requirements in SOLAS Ch. II-2 Reg.15.2.4.
SECTION 5 ELECTRICAL SYSTEMS

1 Electrical power generation and distribution

1.1 General

1.1.1 The electrical power generation and distribution systems shall generally be in compliance with the requirements given in Pt.4 Ch.8. However, the system design requirements given in Pt.4 Ch.8 reflect requirements given in the SOLAS Convention, and in relevant IMO regulations. The system design for a fishing vessel may be modified in line with applicable international and/or national regulations applicable to such vessels, as noted in Sec.1 [5]. This implies e.g. that a division of the main bus-bar may not be required. Further, that requirements to installation and location of the emergency source of power may be somewhat relaxed.

Guidance note:
The flag administration may have requirements for the same as found in [1.1.1]. The stricter one is expected to prevail.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---
SECTION 6 STABILITY AND LOAD LINE

1 Stability

1.1 Application

1.1.1 Vessels with class notations Fishing vessel or Stern trawler with length \( L_{LL} \) of 24 metres and above shall comply with the requirements of Pt.3 Ch.15 (as far as applicable), as well as the requirements of this subsection. The rules cover IMO 2008 Intact Stability Code as applicable for fishing vessels, and Chapter III of the Torremolinos International Conference for the Safety of Fishing Vessels, as modified by the Torremolinos Protocol of 1993, with the exception of Regulation 14.

1.2 Stability criteria

1.2.1 The following general criteria apply:

— the area under the righting lever curve (GZ curve) is not to be less than 0.055 metre-radians up to \( \theta = 30^\circ \) angle of heel and not less than 0.09 metre-radians up to \( \theta = 40^\circ \) or the angle of flooding \( \theta_f \) if this angle is less than 40°. Additionally, the area under the righting lever curve (GZ curve) between the angles of heel of 30° and 40° or between 30° and \( \theta_f \), if this angle is less than 40°, should not be less than 0.03 metre-radians

— the righting lever GZ shall be at least 0.20 m at an angle of heel equal to or greater than 30°

— the maximum righting arm should occur at an angle of heel not less than 25°

Guidance note:

In case the vessel's characteristics render compliance with the above criterion impracticable, the alternative criteria as given in Pt.3 Ch.15 Sec.1 [4.1.3] may be applied upon special consideration.

— the initial metacentric height is not to be less than 0.35 meters in any operating condition.

1.2.2 The metacentric height \( GM \) in light ship condition shall be positive.

1.2.3 Fishing vessels of 45 m in length \( (L_{LL}) \) and over shall comply with the weather criterion of Pt.3 Ch.15 Sec.1 [4.2.1].

1.2.4 Fishing vessels in the length range \( 24 \text{ m} \leq L_{LL} < 45 \text{ m} \) shall comply with the weather criterion of Pt.3 Ch.15 Sec.1 [4.2.1], but the values of wind pressure, \( N/m^2 \), shall be taken from Table 1.

Table 1 Wind pressure

<table>
<thead>
<tr>
<th>( h ) in m</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6 and over</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P ) in ( N/m^2 )</td>
<td>316</td>
<td>386</td>
<td>429</td>
<td>460</td>
<td>485</td>
<td>504</td>
</tr>
</tbody>
</table>

\( h \) = Vertical distance from the centre of the projected vertical area of the ship above waterline, to the waterline.
1.3 Loading conditions

1.3.1 Compliance with the stability criteria shall be documented for the following standard loading conditions:

— departure for the fishing grounds with full fuel, fresh water, stores, ice, fishing gear, etc.
— departure from the fishing grounds with full catch, at maximum draught and no more than 30% fuel, fresh water and stores
— arrival at home port with full catch and 10% fuel, fresh water and stores remaining
— arrival at home port with 20% of full catch and 10% fuel, fresh water and stores remaining
— at fishing grounds with maximum catch on deck, hold empty and 50% fuel, fresh water and stores remaining (if consistent with fishing method).

1.3.2 Special loading conditions associated with a change in the vessel's mode or area of operation which affect the stability, shall be considered.

1.3.3 If water ballast shall be filled between departure and arrival in order to meet the stability criteria, a loading condition shall be included showing when the water ballast shall be taken on board. The condition shall show the situation just before ballasting, with the maximum free surface moments of the ballast tank(s) included.

1.3.4 Allowance for the weight of wet fishing net and tackle on deck, shall be included if applicable.

1.3.5 Allowance for ice accretion according to [1.4.1] shall be shown in the worst operating condition in the stability booklet, if consistent with area of operation.

1.3.6 Homogeneous distribution of catch in all holds, hatch coamings and trunks shall be assumed, unless this is inconsistent with practice. (Volumetric centre of gravity and identical specific gravity for all holds available for catch).

1.3.7 Catch on deck shall be included in the loading conditions showing departure from fishing grounds and arrival at port, if this is consistent with practice.

1.3.8 Free surface effect of catch shall be included, if relevant.

1.3.9 Free surface effect of water in fish bins shall be included in loading condition at fishing grounds, if relevant.

1.3.10 In all loading conditions, full fishing gear and equipment shall be assumed.

1.4 Ice consideration

1.4.1 The calculation of weight and centre of gravity of the ice accretion, shall be based on the following assumptions:

— 30 kg per square metre on exposed weather decks and gangways
— 7.5 kg per square metre for projected lateral area of each side of the vessel above the water plane
— the projected lateral area of discontinuous surfaces of rail, sundry booms, spars (except masts) and rigging of vessels having no sails and the projected lateral area of other small objects should be computed by increasing the total projected area of continuous surfaces by 5% and the static moments of this area by 10%.
1.5 Roll reduction tanks

1.5.1 When equipped with roll reduction tanks, the reduction in stability due to the effect of these tanks shall be allowed for in the loading conditions.

1.5.2 If the roll reduction tanks can not be used in all conditions of loading, an instruction on the use of these tanks and corresponding limit conditions shall be included in the stability booklet. These limit conditions shall show the stability of the vessel just before emptying the roll reduction tanks.

1.6 Water on deck and in compartments temporarily open to sea

1.6.1 Accumulation of water on deck shall be assumed if the requirements on freeing port area (see [2.2.15]) are not fully met, or if the design of the weather deck is such that water may be trapped. The stability calculations shall take the effect of this water into account according to the requirements of [1.6.3] to [1.6.5].

1.6.2 If hatches or similar openings have to be left periodically open during operation, the stability calculations shall take the effect of water in the open compartment(s) into account according to the requirements of [1.6.3] to [1.6.5], provided that the angle of down-flooding for the critical opening is less than 30°.

![Heeling arm: Mw/Δ](image)

**Figure 1 Water on deck criterion**

1.6.3 The ability of the vessel to withstand the heeling effect due to the presence of water on deck, shall be demonstrated by a quasi-static method. With reference to Figure 1, the following criterion shall be satisfied with the vessel in the worst operating condition:

— area «b» shall be equal to or greater than area «a».

The angle that limits area «b» shall be taken as the angle of down-flooding (θ_f) or 40°, whichever is less.

1.6.4 The value of the heeling moment \( M_w \) (or the corresponding heeling arm), due to the presence of water on deck shall be determined assuming that the deck well is filled to the top of the bulwark at its lowest point (or the flooding point of the open compartment). The vessel shall be heeled up to the angle at which this point is immersed (θ_D), where the heeling moment \( M_w \) (or the corresponding heeling arm), shall be terminated.
1.6.5 When calculating $M_W$ the following assumptions shall be made:
— at the beginning the vessel is in the upright condition
— during heeling, trim and displacement are constant and equal to the values for the vessel without the water on deck
— the effect of freeing ports shall be ignored.

1.7 Onboard cranes

1.7.1 The effect on the stability of cranes when used for fishing operations, shall be considered in the stability calculations in accordance with the requirements given in [1.7.2] to [1.7.4].

1.7.2 The maximum possible crane heeling moment shall be assumed. The following shall be considered in the calculation of this moment:
— combination of safe working load on hooks and crane radius
— weight and position of boom relative to crane axis
— two cranes (or more) working in combination (if consistent with practise).

1.7.3 When the effect of the crane heeling moment is checked, the vertical centre of gravity of the loading condition shall be calculated with load on crane hooks. When the static heeling angle exceeds 5°, the heeling lever shall be drawn in the $GZ$ diagram for the critical loading condition(s). Cranes are not to be used at sea, unless it can be demonstrated that the residual stability is sufficient.

1.7.4 Information on operational limitations on use of cranes, if any, shall be included in the stability booklet. This could include limitations on allowable load on hooks for certain conditions of loading. The maximum heeling moment calculated according to [1.7.2] shall be stated in the stability booklet.

1.8 Forces from fishing gear

1.8.1 When special arrangement of the fishing gear (e.g. trawls or purse seines) result in significant forces on the vessel with impact on the stability, this shall be considered in the stability calculations.

1.9 Stability for vessels with qualifier $N$

1.9.1 Vessels complying with the requirements for stability in paragraph 11 of the 1993 regulations of the Norwegian Maritime Authority for FISKE- OG FANGSTFARTØY and the bow height requirements in [2.4], may have the qualifier $N$.

2 Load line

2.1 Freeboard

2.1.1 General requirements
A vessel shall have a draught mark on each side. Draught marks shall be fitted on the sides at midship corresponding to the approved draught with respect to strength and stability. The draught marks shall be in the form of horizontal lines (450 mm long, 25 mm in height) with the letters VL placed 25 mm above the lines (letter dimensions: height - 115 mm, breadth - 75 mm, thickness - 25 mm). The marks shall be permanent, and be painted in contrasting colour.
2.1.2 The freeboard measured from the loaded waterline to the surface of freeboard deck at side, shall in no circumstance be less than 0 mm.

2.1.3 If the freeboard deck surface outside of weathertight enclosed superstructure in any place is lower, measured to the design waterline, than at midship where the draught mark is placed, the minimum freeboard at midship shall be corrected accordingly, so that no part of exposed freeboard deck is lower than the loaded waterline.

2.1.4 Vessels with open connection to sea from fishing wells/tanks for live fish shall have the same freeboard for summer and winter. The freeboard shall be minimum 100 mm.

2.1.5 The freeboard may be taken equal to zero provided a closed superstructure of length not less than $0.45 L_{LL}$ is fitted.

2.2 Openings and closing appliances

2.2.1 Coaming and sill height, closing appliances, freeing ports
Coaming and sill heights, closing appliances, freeing port areas, air pipes, ventilators, sanitary discharges etc. shall be in accordance with the requirements in Pt.3 Ch.12, except as otherwise specified in this subsection.

2.2.2 The height above deck of sills in those doorways, in companionways, erections and machinery casings which give direct access to parts of the deck exposed to the weather and sea shall be at least 600 mm on the freeboard deck and at least 300 mm on the superstructure deck subject to special consideration, where operating experience has shown justification, these heights, except in the doorways giving direct access to machinery spaces, may be reduced to not less than 380 mm and 150 mm, respectively.

2.2.3 Weathertight doors leading to spaces below freeboard deck and to enclosed superstructure included as buoyant in the stability calculations, shall be positioned as close to the vessel's centreline as possible. Weathertight doors shall have a standard equivalent to ISO 6042. Spraytight doors of a standard equivalent to ISO may be accepted as weathertight doors on vessels with service restriction $R2$ and in general for doors in bulkheads which are facing aft and on doors on tween deck in enclosed superstructure.

2.2.4 The height above deck of hatchway coamings shall be at least 600 mm on exposed parts of the freeboard deck and at least 300 mm on the superstructure deck.

2.2.5 Where operating experience has shown justification, and subject to special consideration, the height of the hatchway coamings may be reduced, or the coamings omitted entirely, provided that the safety of the vessel is not thereby impaired. In this case, the hatchway openings shall be kept as small as practicable and the covers be permanently attached by hinges or equivalent means and be capable of being rapidly closed and battened down, or by equally effective arrangements.

2.2.6 Flush deck hatches used for catch of fish should normally be led to a tank or a watertight fish bin. The door/hatch allowing the fish to flow into the processing area shall be interlocked with the flush deck hatches, i.e. one has to close before the other can open. The closing arrangements of the door/hatches shall be operated from deck.

2.2.7 Hatch covers shall be weather- or watertight, with gaskets and necessary securing devices. For hatch covers of more than 4 m², small hatch covers shall be installed as close to the vessel's centreline as possible for use during operation. Such hatch covers shall have securing devices also at the hinged side. Hinged hatch covers shall be securable in open position.

2.2.8 Coaming height and sill height for hatches and doors on working deck in enclosed superstructure and deckhouses where water are used in the working process are not to be less than 100 mm.
2.2.9 In vessels of 45 m in length and over, the height above deck of ventilator coamings, other than machinery space ventilator coamings, shall be at least 900 mm on the freeboard deck and at least 760 mm on the superstructure deck. In vessels of less than 45 m in length, the height of these coamings shall be 760 mm and 450 mm respectively.

2.2.10 Closing appliances in vessels of 45 m in length \((L_{LL})\) and over need not be fitted to ventilators the coamings of which extend to more than 4.5 m above the freeboard deck or more than 2.3 m above the superstructure. In vessels of less than 45 m in length \((L_{LL})\), closing appliances need not be fitted to ventilators the coamings of which extend to more than 3.4 m above the freeboard deck or more than 1.7 m above the superstructure deck.

2.2.11 Below the freeboard deck and in enclosed superstructure on freeboard deck, side scuttles with hinged deadlights shall be used.

2.2.12 Sidescuttles and windows may be accepted without deadlights in side and aft bulkheads of deckhouses located on or above the freeboard deck if satisfied that the safety of the vessel will not be impaired.

2.2.13 Sidescuttles and windows prone to be damaged by fishing gear shall be suitably protected.

2.2.14 Side scuttles in ship sides, including outboard side of enclosed superstructure and deckhouses at ship sides, are not to be closer to the loaded waterline than 500 mm. Such side scuttles shall be equipped with hinged deadlights. Side scuttles closer to the loaded waterline than 1000 mm shall not be possible to open.

2.2.15 The freeing port area, in \(m^2\), on each side of net bins and other short wells on deck with length less than 5 m, may be calculated using the following formula:

\[
A = 0.175 \cdot \ell 
\]

where:

\(\ell\) = length of well, in m.

In short wells of less than 3 m, the freeing port area may be specially considered.

Covers of freeing ports shall be non-closable and hinged in upper edge.

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**Figure 2 Parameters for calculation of freeing port area**
2.2.16 For non-watertight fish bins, a drainage system is required in order to prevent flooding of the working deck area.

2.2.17 Ordinary freeing ports in high bulwarks (more than 1 meter in height), or in sides of open superstructure, are not considered as sufficient for drainage of exposed freeboard deck (may be accepted for vessel with service notation RE). Open superstructure such as open forecastle, separate walls at side or other similar constructions are therefore not acceptable, unless the stability requirements of [1] for water on deck are complied with, or if sufficient drainage is provided according to [2.2.18].

2.2.18 For vessels where the sea may enter over the stern and flood the deck into a superstructure which is open in aft end, the freeing port area, in m², on each side is not to be less than required by the following:

\[ A_{Well} = \left( 0.07 \cdot \ell_2 + 0.004 \cdot \frac{(h-1.2) \cdot \ell_2}{0.1} \right) y_1 y_2 \]

Where the length of the bulwark in the well, \( \ell_2 \), is 20 metres or less, the freeing port areas on each side, in m², in way of the recess and the well are not to be less than:

\[ A_{Well} = \left( 0.7 + 0.035 \cdot \ell_2 + 0.004 \cdot \frac{(h-1.2) \cdot \ell_2}{0.1} \right) y_1 y_2 \]

\[ A_{Recess} = \left( 0.07 \cdot \ell_1 \right) \cdot \frac{b}{\ell_1} \cdot \left( 1 - \left( \frac{\ell_2}{\ell_1} \right)^2 \right) y_1 y_2 \]

\( \ell_1 \) need in no case be taken as greater than 0.7 \( L_{LL} \).

where:

- \( \ell_1 \) = length of deck, in m, as defined in Figure 1
- \( \ell_2 \) = length of bulwark in the well, in m, as defined in Figure 1
- \( y_1 \) = 0.5 for superstructure deck
  = 1.0 for freeboard deck
- \( y_2 \) = 1.5 for no shear
  = 1.0 for suitable shear applied
- \( h \) = average height of bulwark aft of the open superstructure, in m.

Other parameters are defined by Figure 2.

2.2.19 For non-watertight fish bins, a drainage system is required in order to prevent flooding of the working deck area.

2.2.20 Freeing ports over 300 mm in depth shall be fitted with bars spaced not more than 230 mm nor less than 150 mm apart or provided with other suitable protective arrangements. Freeing port covers, if fitted, shall be of approved construction. If devices are considered necessary for locking freeing port covers during fishing operations they shall be easily operable from a readily accessible position.

2.2.21 Poundboards and means for stowage of the fishing gear shall be arranged so that the effectiveness of freeing ports will not be impaired. Poundboards shall be so constructed that they can be locked in position when in use and shall not hamper the discharge of shipped water.

2.2.22 In vessels intended to operate in areas subject to icing, covers and protective arrangements for freeing ports shall be capable of being easily removed to restrict ice accretion. The size of openings and means provided for removal of these protective arrangements shall be considered.
2.3 Signboards

2.3.1 Signboards are required by the rules in:
— Sec.3 [2.1.2] concerning side doors.

2.4 Bow height for vessels with qualifier N

2.4.1 The bow height in mm measured vertically at the forward perpendicular from the loaded waterline to
the exposed deck, shall be at least:
43 \( L_{oA} \) + 310, for vessels up to \( L_{oA} = 24 \text{ m} \)
48 \( L_{oA} \) + 190, for vessels with \( L_{oA} = 24 \text{ m} \) and above.

2.4.2 For vessels of 50 gross tonnage and above, the loaded waterline is the summer load line parallel to the
design waterline.

2.4.3 For vessels below 50 gross tonnage, the loaded waterline is a waterline parallel with the design
waterline corresponding to a freeboard of 100 mm at midship.

2.4.4 The required bow height is considered as complied with when the height is measured from:
— the freeboard deck, having an approximately even sheer from midship to the forward perpendicular
— deck of weathertight enclosed forecastle with length of at least 0.1 \( L_{oA} \), and with sheer in forecastle deck
  (with this minimum forecastle length) not greater than the sheer of the freeboard deck.
With small or no sheer in freeboard deck, the length of weathertight enclosed forecastle may have to be increased.
CHANGES – HISTORIC

July 2016 edition

Main changes July 2016, entering into force 1 January 2017

- Sec.2 Hull
  - Sec.2 [1.3.3]: Strength criteria of lining plats introduced.
  - Sec.2 [1.3.4]: Specified density of polyurethane foam removed.

- Sec.3 Systems and equipment
  - Sec.3 [4.3.2]: Requirement for 30 air changes per hour has been changed to 6 air changes per hour.

October 2015 edition

This is a new document.
The rules enter into force 1 January 2016.

Amendments January 2016

- Sec.1 General
  - Table 2: The table has been updated to only contain additional class notations that are particularly fit for this ship type.
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