RULES FOR BUILDING AND CLASSING

STEEL VESSELS UNDER 90 METERS (295 FEET) IN LENGTH

2012

PART 5
SPECIALIZED VESSELS AND SERVICES

American Bureau of Shipping
Incorporated by Act of Legislature of
the State of New York 1862

Copyright © 2011
American Bureau of Shipping
ABS Plaza
16855 Northchase Drive
Houston, TX 77060 USA
**Foreword (2013)**

This book, Part 5 – “Specialized Vessels and Services”, specifies the requirements for each vessel intended to operate for special service.

Since the requirements for the following seven types of vessel are identical to those requirements in the *Rules for Building and Classing Steel Vessels*, the following cross-reference table is provided, instead of duplication of the text herein:

<table>
<thead>
<tr>
<th>Rules for Building and Classing Steel Vessels Under 90 meters (295 feet) in Length</th>
<th>Applicable Chapter(s) of the Rules for Building and Classing Steel Vessels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1 Vessels Intended for Navigation in Ice</td>
<td>Part 6, Chapter 1</td>
</tr>
<tr>
<td>Chapter 2 Vessels Intended to Carry Oil in Bulk</td>
<td>Part 5C, Chapter 2</td>
</tr>
<tr>
<td>Chapter 3 Vessels Intended to Carry Ore or Bulk Cargoes</td>
<td>Part 5C, Chapter 4</td>
</tr>
<tr>
<td>Chapter 4 Vessels Intended to Carry Liquefied Gases and Chemical Cargoes</td>
<td>Part 5C, Chapters 8 &amp; 9</td>
</tr>
<tr>
<td>Chapter 5 Vessels Intended to Carry Passengers</td>
<td>Part 5C, Chapter 7</td>
</tr>
<tr>
<td>Chapter 6 Vessels Intended to Carry Containers</td>
<td>Part 5C, Chapter 6</td>
</tr>
<tr>
<td>Chapter 7 Vessels Intended to Carry Vehicles</td>
<td>Part 5C, Chapter 10</td>
</tr>
</tbody>
</table>

The requirements for the following types of vessels are specified in the *Rules for Building and Classing Offshore Support Vessels*:

<table>
<thead>
<tr>
<th>Rules for Building and Classing Steel Vessels Under 90 meters (295 feet) in Length</th>
<th>Applicable Chapter(s) of the Rules for Building and Classing Offshore Support Vessels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 8 Fire Fighting</td>
<td>Part 5, Chapter 4</td>
</tr>
<tr>
<td>Chapter 9 Oil Spill Recovery</td>
<td>Part 5, Chapter 6</td>
</tr>
<tr>
<td>Chapter 10 Escort</td>
<td>Part 5, Chapter 13</td>
</tr>
</tbody>
</table>

The requirements for all other unique vessel types are specified in this booklet.
# Specialized Vessels and Services

## CONTENTS

### CHAPTER 11 Vessels Intended for Towing

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1</td>
<td>3</td>
</tr>
<tr>
<td>Section 2</td>
<td>5</td>
</tr>
<tr>
<td>Section 3</td>
<td>6</td>
</tr>
<tr>
<td>Section 4</td>
<td>7</td>
</tr>
<tr>
<td>Section 5</td>
<td>8</td>
</tr>
<tr>
<td>Section 6</td>
<td>9</td>
</tr>
</tbody>
</table>

Appendix 1: Intact Stability Guidelines for Towing Vessels 10
Appendix 2: Guidelines for Bollard Pull Test Procedure 13

### CHAPTER 12 Fishing Vessels

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1</td>
<td>18</td>
</tr>
<tr>
<td>Section 2</td>
<td>20</td>
</tr>
<tr>
<td>Section 3</td>
<td>25</td>
</tr>
<tr>
<td>Section 4</td>
<td>39</td>
</tr>
<tr>
<td>Section 5</td>
<td>40</td>
</tr>
<tr>
<td>Section 6</td>
<td>41</td>
</tr>
</tbody>
</table>

### APPENDIX 1 Requirements for Building and Classing Vessels Intended for Service in Domestic Waters 42
This Page Intentionally Left Blank
PART 5

CHAPTER 11 Vessels Intended for Towing

CONTENTS

SECTION 1 General ...................................................................................................... 3
  1 Application ............................................................................................................ 3
  3 Classification ....................................................................................................... 3
    3.1 Tugs .................................................................................................................. 3
    3.3 Dual Purpose Vessels ..................................................................................... 3
  5 Optional Record Entries .................................................................................... 3
    5.1 Quick Release ................................................................................................. 3
  7 Submission of Data ............................................................................................. 3
  9 Definitions ............................................................................................................ 4
    9.1 Static Bollard Pull ........................................................................................... 4
    9.3 Reference Load ................................................................................................. 4

SECTION 2 Stability ..................................................................................................... 5
  1 Intact Stability During Tow .................................................................................... 5

SECTION 3 Towing Gear ............................................................................................. 6
  1 Arrangement .......................................................................................................... 6
  3 Quick Release Device .......................................................................................... 6
  5 Strength ................................................................................................................ 6
    5.1 Towline ............................................................................................................. 6
    5.3 Towing Hook, Towing Winch, Towing Bollard and Towing Bitts .................... 6
    5.5 Supporting Structures ..................................................................................... 6
    5.7 Connections ...................................................................................................... 6

SECTION 4 Vessel Design ........................................................................................... 7
  1 Side Shell and Frames .......................................................................................... 7
  3 After Deck ............................................................................................................ 7
  5 Weather Deck Openings ....................................................................................... 7

SECTION 5 Equipment .................................................................................................. 8

SECTION 6 Tests .......................................................................................................... 9
  1 Quick Release Test ................................................................................................. 9
  3 Static Bollard Pull Test .......................................................................................... 9
APPENDIX 1  Intact Stability Guidelines for Towing Vessels .................................10
1  General ........................................................................................................10
3  Submission of Plans ..................................................................................10
5  Intact Stability Criteria .............................................................................10
7  Standard Loading Conditions .................................................................11
  7.1 Loading Conditions ..............................................................................11
  7.3 Load Considerations .............................................................................11
9  Heeling Arm Curve ..................................................................................11
11 Trim and Stability Booklet .......................................................................12

TABLE 1  Towline Pull Force .........................................................................12

FIGURE 1  Righting Arm and Heeling Arm Curves .......................................11

APPENDIX 2  Guidelines for Bollard Pull Test Procedure ...............................13
1  General ......................................................................................................13
3  Steady Bollard Pull Test Requirements .....................................................13
PART 5

CHAPTER 11 Vessels Intended for Towing

SECTION 1 General

1 Application

The requirements in this section apply to vessels intended for unrestricted towing service.

3 Classification

3.1 Tugs

In accordance with 1-1-3/3 of the ABS Rules for Conditions of Classification (Part 1), the classification A1 Towing Vessel is to be assigned to vessels designed primarily for towing service and built to the requirements of this section and other relevant sections of the Rules.

3.1.1 Bollard Pull (2001)

The static bollard pull, determined by an approved bollard pull test in the presence of the Surveyor, will be indicated in the Record. See 5-11-6/3.

3.3 Dual Purpose Vessels

Vessels intended for towing and other services, such as supplying stores to offshore units and installations, may be classed A1 Towing Vessel.

Alternatively, at the request of the Owner, these vessels may be classed A1 with an appropriate notation in column 5 of the Record, for example, Combination Tug & Support Vessel.

In both instances, the dual purpose vessel is to be designed and built to these requirements, in addition to those as may be applicable for the particular services.

5 Optional Record Entries

5.1 Quick Release

At the request of the owner and where a remotely controlled quick release device is provided for the towing hook or towing winch, in accordance with 5-11-3/3, 5-11-3/5.3 and 5-11-6/1, the letters QR will be entered in the column 5 of the Record.

7 Submission of Data

In general, in addition to the plans listed in 1-1-4/1 of the Supplement to the ABS Rules for Conditions of Classification (Part 1) and 4-1-1/7 of these Rules, the following plans and particulars are to be submitted.

- Structural details and arrangements of the structures in way of the towing hook, towing winch, or towing bollards, or bitts, towing guide rollers and fairleads.
- Details of connections (See 5-11-3/5.7).
- Braking power of winch.
- (2001) Estimated static bollard pull, together with the method of prediction. (The estimated value is to be confirmed at Trials prior to certification.)
• Minimum specified breaking strength of towline.
• Stability data and calculations.

9 Definitions

9.1 Static Bollard Pull (2001)
Static bollard pull (BP) for use in 5-11-1/9.3 is the value submitted by the designer, in accordance with 5-11-1/7. Static bollard pull will be entered in the Record, in accordance with 5-11-1/3.1. BP for use in 5-11-1/9.3 is to be taken as not less than the design value nor more than the value obtained by testing and published in the Record. See 5-11-6/3.

9.3 Reference Load
Reference Load (RL) in the design and testing of towing gear is 2BP. For BP greater than 51 tf (50 Ltf), consideration will be given to a reduction in RL. For a BP of 51 tf (50 Ltf), RL is 2BP and for a BP of 153 tf (150 Ltf) or more, RL may be taken as 1.33BP, with interpolation for intermediate values of BP.
CHAPTER 11 Vessels Intended for Towing

SECTION 2 Stability

1 Intact Stability During Tow

The intact stability of the vessel for towing operation is to comply with a recognized standard. The submission of evidence showing approval by an Administration of stability of the vessel for the static bollard pull (see 5-11-1/9.1) will be acceptable. Alternatively, upon request, the review will be performed by ABS. See Appendix 5-11-A1 for ABS guidelines.
PART 5

CHAPTER 11 Vessels Intended for Towing

SECTION 3 Towing Gear

1 Arrangement
The towing hook, towing winch, towing bitt or towing bollard is to be located as low as is practicable, and close to, but abaft of, the center of gravity of the towing vessel in the expected towing condition. Rollers or fairleads are to be arranged so as to contain the towline within the design limit of its sweep. Effective means are to be provided to lead and restrain the towline over the stern of the towing vessel.

3 Quick Release Device
Where entry QR in column 5 of the Record is requested in accordance with 5-11-1/5.1, the quick release device for the towing hook or towing winch is to be operable from the bridge or other normally manned location in direct communication with the bridge. The quick release device is to disengage the towline at any combination of expected trim and heel.

5 Strength

5.1 Towline
The breaking strength of towline is to be not less than the Reference Load (RL). See 5-11-1/9.3.

5.3 Towing Hook, Towing Winch, Towing Bollard and Towing Bitts
The towing hook, towing winch, towing bollard and towing bitt are to be capable of sustaining RL without permanent deformation. These items are to comply with a recognized standard or code of practice. Name plates indicating the names of standard, rated load, speed, mass, etc., will be acceptable for that purpose. Other means for verifying compliance will also be considered.

The installation of these items is to be to the satisfaction of the Surveyor.

5.5 Supporting Structures
The stresses in the structures supporting the items in 5-11-3/5.3 are not to exceed the following under a pull of RL applied horizontally and within a range of 30 degrees from the centerline of the vessel on each side.

Normal Stress = 0.75Y
Shear Stress = 0.45Y

where

Y = specified minimum tensile yield strength or yield point.

In addition, the buckling strength is to be adequate for the above loading.

5.7 Connections
The size and arrangement of holding down bolts and welds for towing hook or towing winch are to be in accordance with a recognized standard.
PART 5

CHAPTER 11 Vessels Intended for Towing

SECTION 4 Vessel Design

1 Side Shell and Frames
For vessels subject to impact loadings during routines, it is recommended that side frames with section modulus 25% greater than that obtained from 3-2-5/3.1, 3-2-5/5.1 or 3-2-5/5.3 be considered. For side shell plating, see 3-2-2/5.3.

3 After Deck
Deck fittings within the sweep of towline are to be protected against contact by the towline and against the towline fouling.

5 Weather Deck Openings
Openings in the weather deck intended to be used at sea and leading to spaces below the freeboard or superstructure deck, including emergency exits, are to be protected as required in 3-2-12/23.3 with sill height of doors at least as required by 3-2-12/Table 1 for companionways.

Access openings, including emergency exits, are to be located clear of the towline sweep area.
PART 5

CHAPTER 11 Vessels Intended for Towing

SECTION 5 Equipment

Equipment is to be in accordance with Section 3-5-1, except that the equipment number (EN) may be calculated using 3-5-1/3.5. The number, weight and sizes of equipment differing from 3-5-1/Table 1 may be specially considered for limited service. See also 1-1-3/11 of the ABS Rules for Conditions of Classification (Part 1).
PART 5

CHAPTER 11 Vessels Intended for Towing

SECTION 6 Tests

In addition to the tests required by the relevant sections, the following tests are to be conducted to the satisfaction of the Surveyor.

1 Quick Release Test (2005)

Where the entry QR in the Record is requested in accordance with 5-11-1/5.1, the effectiveness of the quick release device is to be demonstrated during initial sea trial. The test is to be conducted to the manufacturer’s recommendations.

3 Static Bollard Pull Test (1 July 2008)

The static bollard pull test procedure is to be submitted for review by the attending Surveyor in advance of the test.

The first vessel of a series is to have a bollard pull test conducted in all cases. The requirements for conducting a bollard pull test on vessels of duplicate design and built in a series will be specially considered on a case-by-case basis. However, a bollard pull test certificate will only be issued to those vessels for which the BP notation is requested and the bollard pull test is actually carried out.

The static bollard pull is to be measured with the tug at the maximum continuous rpm and at or near the maximum towing depth. The towed vessel is to be in ballast condition but need not be down to the summer load line mark.

The static bollard pull is the pull that is recorded over the state of equilibrium without any tendency to decline.

The depth of water under the keel in the testing area should be at least two times the vessel draft at amidships.

For additional test criteria, see Appendix 5-11-A2 “Guidelines for Bollard Pull Test Procedure” of these Rules.
PART 5

CHAPTER 11 Vessels Intended for Towing

APPENDIX 1 Intact Stability Guidelines for Towing Vessels (1998)

1 General

The intact stability of each towing vessel is to be evaluated for the loading conditions indicated in 5-11-A1/7 for compliance with the intact stability criteria in Section 5-11-2, and the results are to be submitted. For every loading condition, which is to be shown in the Trim and Stability Booklet, the righting arm curve (GZ curve) should be plotted using the VCG corrected for the free surface effects of liquid in tanks.

3 Submission of Plans

The following drawings are to be submitted with the Trim and Stability Booklet for our review:

i) General arrangement plan

ii) Capacity plan or table with centers of gravity

iii) Lines plan

iv) Hydrostatic curve or table

v) Cross curves of stability

vi) Downflooding angle versus draft curve. The downflooding angle is the first of the angle of heel at which openings in the hull, superstructures or deck houses which cannot be closed weathertight immerse.

5 Intact Stability Criteria

The following stability criteria are to be complied with:

i) The area under the righting lever curve (GZ curve) should not be less than 0.055 meter-radians (10.3 ft-degrees) up to $\theta = 30^\circ$ angle of heel and not less than 0.09 meter-radians (16.9 ft-degrees) 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°, is not to be less than 0.03 meter-radians (5.6 ft-degrees).

ii) The righting lever GZ is to be at least 0.20 m (0.66 ft) at an angle of heel equal to or greater than 30°.

iii) The maximum righting arm is to occur at an angle of heel not less than 25°.

iv) The initial metacentric height, $GM_0$, is not to be less than 0.15 m (0.49 ft).

v) The area of the residual dynamic stability (area between righting and heeling arm curves to the right of the first intercept) up to an angle of heel of 40° plus the angle of the first intercept ($A_1 + A_2$), or the angle of downflooding, if this angle is less than 40° plus the angle of the first intercept ($A_1$), should not be less than 0.09 meter-radians. (See 5-11-A1/Figure 1.)
7 Standard Loading Conditions

7.1 Loading Conditions
The following conditions of loading are to be examined in the Trim and Stability Booklet:

i) Vessel with full stores and fuel;

ii) Vessel with 10 percent stores and fuel remaining;

iii) Any other normal conditions, both departure and arrival that the Owner feels are appropriate or more suitable to the vessel’s trade.

7.3 Load Considerations
The following are the assumptions for calculating loading conditions:

i) In Loading Condition 5-11-A1/7.1i) above, it should be assumed that the vessel is loaded to its assigned load line with water ballast tanks empty.

ii) If any loading condition water ballast is necessary, additional diagrams should be calculated, taking into account the water ballast. Its quantity and disposition should be stated.

iii) In calculating the free surface corrections, it should be assumed that for each type of liquid, at least one transverse pair or a single centerline tank has a free surface and the tank or combination of tanks that is to be taken into account should be those where the effect of free surface is the greatest.

9 Heeling Arm Curve
The heeling moment due to the towline pull should be calculated using the corresponding percentage of the maximum bollard pull, depending on the type of propulsion (see below), at right angles to the vessel’s fore and aft axis. The resultant moment should be converted to a heeling arm and plotted on the same graph as the righting arm curve (GZ curve). The heeling arm curve can be taken to vary with the cosine of the heeling angle.

Regarding the bollard pull force, the value is usually requested as it is derived from the actual test at maximum RPM. However, in preliminary considerations, a calculated value would be accepted based on the corresponding value of pounds of bollard pull force per SHP, depending on the type of propulsion (see 5-11-A1/Table 1). The heeling arm should be taken from the top of the towing bitt to the VCB or for an approximation to 1/2 the mean draft.
11 **Trim and Stability Booklet**

The Master of the vessel should receive information in the Trim and Stability Booklet regarding ballasting, towing, etc., to ensure that the stability is in compliance with the criteria given in 5-11-A1/5.

The Trim and Stability Booklet should also contain a table giving the free surface moments for all tanks designed for liquid. If any set of tanks are cross-connected, the free surface moment shall be calculated about the vessel’s centerline.

### TABLE 1
**Towline Pull Force**

<table>
<thead>
<tr>
<th>Type of Propulsion</th>
<th>Bollard Pull (lbs/SHP)</th>
<th>Percentage of Bollard Pull at 90°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twin screw with open propellers, or other types not listed below</td>
<td>30</td>
<td>50%</td>
</tr>
<tr>
<td>Twin screw with open propellers and flank rudders</td>
<td>30</td>
<td>50%</td>
</tr>
<tr>
<td>Twin screw with conventional non-movable nozzles</td>
<td>35</td>
<td>50%</td>
</tr>
<tr>
<td>Water Tractor Tug with twin propeller Z-drives (steerable propellers with nozzles)</td>
<td>35</td>
<td>70%</td>
</tr>
<tr>
<td>Water Tractor with twin cycloidal propellers (vertical axis)</td>
<td>30</td>
<td>70%</td>
</tr>
</tbody>
</table>
PART 5

CHAPTER 11 Vessels Intended for Towing

APPENDIX 2 Guidelines for Bollard Pull Test Procedure (2001)

1 General

This Appendix is prepared as a guide for compliance with the requirements of 5-11-6/3.

Prior to conducting the steady bollard pull test, a written request should be received from the Owner of ABS attendance and addressing items 5-11-A2/3.15 and 5-11-A2/3.17 below. Only ABS-classed vessels may be attended for the test.

3 Steady Bollard Pull Test Requirements

3.1 The towing vessel should be on an even keel or trimmed to the intended operating condition in tow.

3.3 The draft of the towing vessel should be equal to or deeper than ballast condition, but need not be down to the summer load line mark.

3.5 Depth of water under the keel and on each side of the vessel should be at least $2 \times$ vessel draft at midship.

3.7 If current exceeds 1 knot, its effect is to be subtracted from the bollard pull by either:

i) Direct measurement of drag effect (pulling direction downstream) and reduction of bollard pull accordingly; or,

ii) Conducting pull test both upstream and downstream and averaging the results.

3.9 The distance from the stern of the towing vessel to the bollard (fixed point) should be at least two ship lengths and be unobstructed by submerged pilings, bulwarks, etc.

3.11 Wind speed should be 10 mph or less, or such that it does not measurably affect the bollard pull results.

3.13 Sea condition should be calm.

3.15 A statement should be obtained from the vessel’s Master or Owner’s Representative that the propellers are those approved by ABS for the vessel.
3.17
The Owners should be satisfied as to the structural adequacy of the towing hawser, towing winch or tow bitts employed during the test.

3.19
The vessel’s stability letter should include the towing condition.

3.21
The dynamometer (load cell) used for the test should be calibrated and suitable for use in the horizontal position. It should be fitted with swivels or should be torque insensitive, such as a hydraulic dynamometer. It should be easily read from a safe location or a remote readout should be provided. A continuous recording device is suggested but not mandatory. It is suggested that the maximum scale reading be, as a minimum, at least equal to \([\text{Max. Cont. Total H.P.} \times 50 \text{ (LBS.)}]\). The dynamometer should be located at the ashore end of the tow hawser.

3.23
The vessel’s main engines should not be adjusted to operate in overload condition. Engine overspeed trip setting should be verified prior to commencing the test.

3.25
The Steady Bollard Pull should be computed as the average of evenly spaced load cell recordings taken over a sustained pull interval of three to five minutes. If the tow hawser is not horizontal, the vertical angle of the hawser is to be measured and used to obtain the actual horizontal thrust.

Engine temperatures should be at steady state during the test run. Engines should be operated at the ABS maximum continuous horsepower (certified horsepower per the Record) during the test. Instantaneous spike bollard pull readings should be ignored.

3.27 (2006)
In general, two Surveyors are required when conducting the test, one ashore and one in the engine room. A two-way voice communication system is to be provided for the test.

When a survey is carried out at the initial testing for new construction, consideration may be given to conducting the test with one Surveyor in engine room where a continuous recording device suitably calibrated is used to record the bollard pull. This relaxation of two Surveyor requirements is to be included in a written request submitted as noted in 5-11-A2/1.
# Part 5

## Chapter 12: Fishing Vessels (2001)

### Contents

<table>
<thead>
<tr>
<th>Section 1</th>
<th>General</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Classification</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>Geographical Limitations</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>Governmental and Other Regulations</td>
<td>18</td>
</tr>
<tr>
<td>7</td>
<td>International Conference on Safety of Fishing Vessels, 1977</td>
<td>18</td>
</tr>
<tr>
<td>9</td>
<td>Plans</td>
<td>19</td>
</tr>
<tr>
<td>11</td>
<td>Stability Requirements</td>
<td>19</td>
</tr>
<tr>
<td>11.1</td>
<td>Stability Information</td>
<td>19</td>
</tr>
<tr>
<td>11.3</td>
<td>Stability Standards</td>
<td>19</td>
</tr>
<tr>
<td>11.5</td>
<td>Inclining Experiment</td>
<td>19</td>
</tr>
<tr>
<td>13</td>
<td>Strengthening for Navigation in Ice</td>
<td>19</td>
</tr>
<tr>
<td>15</td>
<td>Refrigerated Fish Carrier</td>
<td>19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section 2</th>
<th>Vessel Design</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fish Hold Bulkheads</td>
<td>20</td>
</tr>
<tr>
<td>1.1</td>
<td>General</td>
<td>20</td>
</tr>
<tr>
<td>1.3</td>
<td>Uprights</td>
<td>20</td>
</tr>
<tr>
<td>1.5</td>
<td>Portable Fish Hold Division</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Side Shell – Local Strengthening</td>
<td>22</td>
</tr>
<tr>
<td>3.1</td>
<td>General</td>
<td>22</td>
</tr>
<tr>
<td>3.3</td>
<td>Vessels with Side Trawls</td>
<td>22</td>
</tr>
<tr>
<td>3.5</td>
<td>Vessels with Stern Trawls</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>Deck Plate</td>
<td>22</td>
</tr>
<tr>
<td>5.1</td>
<td>Local Reinforcement</td>
<td>22</td>
</tr>
<tr>
<td>7</td>
<td>Protection of Deck Openings</td>
<td>22</td>
</tr>
<tr>
<td>7.1</td>
<td>General</td>
<td>22</td>
</tr>
<tr>
<td>7.3</td>
<td>Hatchway Coamings, Companionway Sills and Access Sills</td>
<td>22</td>
</tr>
<tr>
<td>9</td>
<td>Bulwarks, Rails, Ports, Portlights and Ventilators</td>
<td>23</td>
</tr>
<tr>
<td>9.1</td>
<td>Details of Freeing Ports</td>
<td>23</td>
</tr>
<tr>
<td>9.3</td>
<td>Pound Boards</td>
<td>23</td>
</tr>
<tr>
<td>11</td>
<td>Miscellaneous</td>
<td>23</td>
</tr>
<tr>
<td>11.1</td>
<td>Storm Rails</td>
<td>23</td>
</tr>
<tr>
<td>11.3</td>
<td>Guard Rails, etc</td>
<td>23</td>
</tr>
<tr>
<td>11.5</td>
<td>Stern Doors</td>
<td>23</td>
</tr>
<tr>
<td>13</td>
<td>Freeboard, Draft Marks</td>
<td>24</td>
</tr>
<tr>
<td>15</td>
<td>Cargo Handling Equipment</td>
<td>24</td>
</tr>
</tbody>
</table>
SECTION 3  Intact Stability ........................................................................................................ 25
1  Intact Stability – General .......................................................................................... 25
3  Intact Stability Criteria .......................................................................................... 25
  3.1  General ............................................................................................................. 25
  3.3  Alternate Criteria ............................................................................................. 26
5  Severe Wind and Rolling Criteria ........................................................................... 27
  5.1  General ............................................................................................................... 27
7  Standard Loading Conditions ................................................................................. 30
  7.1  Loading Conditions .......................................................................................... 30
  7.3  Load Considerations .......................................................................................... 31
9  Design and Operating Factors Affecting Stability .................................................. 31
  9.1  Lightship and the Inclining Experiment ............................................................ 31
  9.3  Calculation of Righting Arms ......................................................................... 32
  9.5  Effect of Trim ..................................................................................................... 32
  9.7  Free Surface Effects .......................................................................................... 33
  9.9  Treatment of Lifting Weights and Heeling Moments Due to Fishing Gear ......... 33
  9.11 Ballast ................................................................................................................ 35
  9.13 Watertight Integrity and Flooding ...................................................................... 36
  9.15 Icing .................................................................................................................... 37
  9.17 Water on Deck .................................................................................................... 37

TABLE 1  Values of Factor $X_1$ ...................................................................................... 30
TABLE 2  Values of Factor $X_2$ ...................................................................................... 30
TABLE 3  Values of Factor $k$ .......................................................................................... 30
TABLE 4  Values of Factor $s$ .......................................................................................... 30

FIGURE 1  Intact Stability Criteria for Fishing Vessels .................................................. 26
FIGURE 2  Severe Wind and Rolling Criteria ................................................................. 29
FIGURE 3  Lifting Criteria ............................................................................................ 34
FIGURE 4  Calculating the Effect of a Fastened Trawl ................................................ 35
FIGURE 5  Diagram of Key Watertight Closures .......................................................... 36
FIGURE 6  Method of Treatment of Water on Deck ...................................................... 38
FIGURE 7  Volume of Water to be Included in Calculating Effect of Water on Deck ....... 38

SECTION 4  Equipment ................................................................................................... 39
1  Wire Rope .................................................................................................................. 39
SECTION 5 Machinery Equipment and Systems ................................................................. 40
   1 Inclinations ........................................................................................................... 40
   3 Liquid Petroleum Gas .......................................................................................... 40
   5 Electrical Installation ......................................................................................... 40
       5.1 General ......................................................................................................... 40
       5.3 Emergency Lighting .................................................................................... 40
       5.5 Cables – Construction ................................................................................. 40
   7 Refrigeration Plant .............................................................................................. 40

SECTION 6 Surveys ........................................................................................................ 41
   1 Surveys After Construction ............................................................................... 41
PART 5

CHAPTER 12 Fishing Vessels (2001)

SECTION 1 General

1 Classification

In accordance with 1-1-3/3 of the ABS Rules for Conditions of Classification (Part 1) the classification ⚝A1 Fishing Vessel will be given to vessels which have been built to the satisfaction of the ABS Surveyors in accordance with these requirements and other relevant sections of the Rules and approved by the Committee for unrestricted service. In addition, as applicable, an entry will be made in the Record describing the vessel as Side Trawl or Stern Trawl.

The requirements of this Chapter are applicable to self-propelled fishing vessels under 90 meters (295 ft) in length that are commercially engaged in the catching, taking or harvesting of fish or an activity that is expected to result in the catching, taking or harvesting of the fish including fishing vessels which also process their catch. This Chapter is not intended to apply to vessels used exclusively for processing fish or other living resources of the sea, research or training, or fish carriers.

3 Geographical Limitations

Vessels which have been built to the satisfaction of the ABS Surveyors to special modified requirements for a limited or restricted service, where approved by the Committee for that particular service will be classed and distinguished in the Record by the symbols and notation as described in 5-12-1/1 above. The symbols and notations will either be followed by or have included in them the appropriate service limitations.

5 Governmental and Other Regulations

While these Rules cover the requirements for the classification of fishing vessels, the attention of Owners, designers, and builders is directed to the regulations of governmental, canal, and other authorities dealing with such matters as pollution control, emergency power supply, navigation aids, bilge pumping arrangements, piping details, fire protection.

7 International Conference on Safety of Fishing Vessels, 1977

Where authorized by the Administration of a country signatory to the International Conference on Safety of Fishing Vessels, 1977/1993 Protocol, and upon request of the Owners of an existing vessel or a vessel under construction, ABS will review plans and survey the vessel for compliance with the provisions of this Convention/Protocol and certify thereto in the manner prescribed in the Convention/Protocol.

Upon request of the Owner, ABS will review plans and survey an existing vessel or vessel under construction for compliance with the provisions of the International Conference on Safety of Fishing Vessels, 1977/1993 Protocol and will issue a special certificate certifying that the fishing vessel complies with this Convention/Protocol.

Where the vessel has been found to be in compliance with the provisions of the International Conference on Safety of Fishing Vessels, 1977/1993 Protocol, it will be distinguished in the Record by the words Torremolinos Convention.
9 Plans

In addition to the plans required to be submitted by Section 1-1-4 of the Supplement to the ABS Rules for Conditions of Classification (Part 1) and 4-1-1/7 of these Rules, the following plans are to be submitted in the same manner:

- Lines and offsets
- Curves of Form (hydrostatic)
- Cross Curves of Stability
- Capacity Plan, giving centers of gravity and tank free surface corrections.

11 Stability Requirements

11.1 Stability Information

Each vessel is to be provided with stability information in a format acceptable to ABS. The format may be pictorial, tabular, simplified trim and stability booklet or other format that will provide a rapid means for the crew to evaluate the stability of the vessel.

Information is to be submitted on ballast, fuel, supplies and fish hold arrangement and capacities; summary and distribution of fixed and variable weights, (including pots, traps, power-blocks, skiffs, wet nets, etc.) for each reviewed condition; and information on all loaded and ballasted conditions in which the vessel may be operated. (See also Section 5-12-3)

Where the stability review has been conducted and found satisfactory by the flag state administration, the stability information and calculations as required by Section 5-12-3 need not be submitted.

11.3 Stability Standards

The stability information is to be based on the data submitted resulting from the intact stability analysis. The intact stability analysis is to be based on the applicable part of the IMO A749(18) “Code on Intact Stability for All Types Ships Covered by IMO Instrument”, as amended by MSC 75(69).

11.5 Inclining Experiment

The inclining experiment or deadweight survey, if applicable, is to be conducted on each fishing vessel.

The responsibility for preparing the vessel for the test and conducting the test rests with the owner, shipbuilder or naval architect. The Surveyor will verify all of the data and will assist only as necessary to obtain valid test results. Where the inclining experiment is conducted by flag state administrations, the Surveyor is to witness the inclining experiment. Also see 5-12-3/1.

13 Strengthening for Navigation in Ice

Where it is intended to strengthen the vessel for navigation in Ice, and the Owner desires a notation in the Record, the vessel is to comply with the requirements in Part 6, Chapter 1 of the Steel Vessel Rules. It is the responsibility of the owner to determine which class is most suitable for his intended service.

15 Refrigerated Fish Carrier

Where Fishing Vessels are provided with facilities for chilling, cooling, or freezing and/or storage in the refrigerated cargo holds cooled by their own shipboard refrigeration machinery and the associated system the vessel is to comply with the requirements in Part 6, Chapter 2 of the Steel Vessel Rules.
PART 5

CHAPTER 12 Fishing Vessels (2001)

SECTION 2 Vessel Design

1 Fish Hold Bulkheads

1.1 General

Where portable fish hold divisions are fitted, they are to be clearly indicated on the drawings submitted for review. Every portable fish hold division is to extend from the bottom of the hold to the deck.

1.3 Uprights

The section modulus of steel uprights (5-12-2/Figure 1) is not to be less than that obtained from the following equation.

\[ SM = 4.0psbh^2 \text{ cm}^3 \]
\[ SM = 0.329 \times 10^{-4} \text{ psbh}^2 \text{ in}^3 \]

where

\[ s = \text{maximum transverse spacing between supports, in m (ft)} \]
\[ b = \text{maximum longitudinal spacing between supports, in m (ft)} \]
\[ h = \text{maximum unsupported span of the stanchion, in m (ft)} \]
\[ p = \text{density of cargo, in metric tons/m}^3 \text{ (lbs/ft}^3) \]

Where the uprights are permanent and welded attachments are provided at both ends, reduced scantlings can be considered on the end connections.

Where the uprights are constructed of aluminum, wood or other material, the scantlings will be specially considered.

1.5 Portable Fish Hold Division

1.5.1 Wooden Boards

The thickness of portable wooden boards (5-12-2/Figure 1) in centimeters (inches) is to be obtained from the following equations:

1.5.1(a) Horizontal boards

\[ t = 2.83 \sqrt{(psb^2)} \text{ cm} \quad t = 0.0235 \sqrt{(psb^2)} \text{ in.} \]

1.5.1(b) Vertical boards

\[ t = 1.90 \sqrt{(ps\ell^2)} \text{ cm} \quad t = 0.0157 \sqrt{(ps\ell^2)} \text{ in.} \]

where

\[ t = \text{thickness of wooden divisions, in cm (in.)} \]
\[ \ell = \text{vertical span of wooden division, in cm (in.)} \]

\[ p, s \text{ and } b \text{ are as defined in 5-12-2/1.3.} \]
The formulae are applicable to longitudinal divisions. Where the divisions are athwartships the formulae should be modified by interchanging $s$ and $b$. The thickness used may be rounded off to the nearest 3 mm ($\frac{1}{8}$ in.) of the nearest standard thickness. The timber used is to be of durable quality, of a type and grade that has proved satisfactory for fish-hold divisions and the actual finished thickness of boards should be those derived from the equations. The thickness of the boards made of good quality hardwood may be reduced by 12.5 percent.

### 1.5.2 Metallic Boards

The section modulus of portable metallic boards is not to be less than that obtained from the following equation for horizontal or vertical members.

$$ SM = 4k pasb^2 \, \text{cm}^3 $$

$$ SM = 0.329 \times 10^{-4} kpasb^2 \, \text{in}^3 $$

where

- $a = \text{width of metallic board, in m (ft)}$
- $\ell = \text{unsupported span of vertical boards, in m (ft)}$
- $k = 1.0$ for steel
- $= 0.9 (Q_o)$ for aluminum

$$ Q_o = \frac{65}{(Y_{al} + U_{al})} \quad \text{SI/MKS Units} $$

$$ = \frac{92000}{(Y_{al} + U_{al})} \quad \text{U.S. Units} $$

$U_{al}$ = minimum ultimate strength of the welded aluminum alloy under consideration, in kg/mm ($\text{psi}$)

$Y_{al}$ = minimum yield strength of the welded aluminum alloy under consideration at 0.2% offset in a 254 mm (10 in.) gauge length, in kg/mm$^2$ ($\text{psi}$)

$p$, $s$ and $b$ are as defined in 5-12-2/1.3.

The formulae are applicable to longitudinal divisions. Where the divisions are athwartships the formulae should be modified by interchanging $s$ and $b$.

---

**FIGURE 1**

**Horizontal Wood Boards – Steel Uprights**
3 Side Shell – Local Strengthening

3.1 General
Wear plates or rollers are recommended at all places where fishing gear will subject the shell plating to accelerated wear. Special strengthening may be required in areas where small boats are regularly launched, retrieved, or stowed. Special strengthening may be required also in areas where the vessel makes contact with another vessel when pursing, hauling, brailing, pumping, loading, unloading or running together.

3.3 Vessels with Side Trawls
In way of trawl gallows the minimum thickness of the side shell plating is to be 30% greater than the thickness of the side shell plating obtained from 3-2-2/5. In a vessel fitted with two or more gallows, the minimum thickness of the side shell plating between the gallows is to be 20% greater than the thickness of the side shell plating obtained from 3-2-2/5. Half round rub bars are to be installed at the top of the bulwark the top of the sheerstrake and at the designed waterline. These bars are to extend from not less than 150 mm (6 in.) forward of the forward leg of each gallows to not less than 305 mm (12 in.) aft of the forward gallows leg. Additional half-round rub bars are to be installed vertically or diagonally between the longitudinal rub bars in such a manner that shell plating welds are not subject to abrasion by the gear being handled by the gallows.

3.5 Vessels with Stern Trawls
The minimum thickness of the stern trawl chute is to be 30% greater than the thickness on the side shell plating obtained from 3-2-2/5. The minimum thickness of the chute sides is to be 10% greater than the thickness of the side shell plating obtained from 3-2-2/5. Wear plates are recommended at parts of the chute subject to accelerated wear.

5 Deck Plate

5.1 Local Reinforcement
The deck plating where subject to abrasion such as from the fishing gear is to be reinforced locally. The horizontal plating and the vertical plating are to be increased by approximately 30% and 10% respectively above the thickness of the deck plating in 3-2-3/3 or suitable deck coverings are to be provided. Positive means are to be provided to minimize the movement of the gear on deck due to the vessel motions in a seaway.

7 Protection of Deck Openings

7.1 General
All openings in decks are to be framed to provide efficient support and attachment for the ends of the deck beams. The proposed arrangements and details for all hatchways are to be submitted for approval.

7.3 Hatchway Coamings, Companionway Sills and Access Sills
The height above deck of coamings of hatchways, sills of companionways and access openings, is to be not less than given in 5-12-2/Table 1.

A companionway is a structure whose primary purpose is to protect an access in a deck. An access door in a superstructure or house is considered a companionway only if the access in a deck is adjacent to the door or if it is the sole access to the superstructure or house. A companionway opening, with a space or passageway and an inner joiner door with 100 mm (4 in.) sill, may have a sill height as required for access sills in 5-12-2/Table 1.
9 Bulwarks, Rails, Ports, Portlights and Ventilators

9.1 Details of Freeing Ports
Freeing ports are to be so arranged along the length of bulwarks as to ensure that the deck is freed of water most rapidly and effectively. Lower edges of freeing ports shall be as near the deck as practicable.

Freeing ports over 300 mm (11.8 in.) in depth are to be fitted with bars spaced not more than 230 mm (9 in.) nor less than 150 mm (6 in.) apart or provided with other suitable protective arrangements. Freeing port covers, if fitted, are to be submitted for review. If devices are considered necessary for locking freeing port covers during fishing operations they are to be easily operable from a readily accessible position.

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

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

11 Miscellaneous

11.1 Storm Rails
Storm Rails are to be fitted on the outside of deck houses.

11.3 Guard Rails, etc.
Guard rails, gangways, lifelines or underdeck passages are to be provided for the crew to get between quarters, machinery spaces and other working areas.

11.5 Stern Doors
Stern trawlers are to have doors, gates or other protective arrangements at the top of the stern ramp as high as the adjacent bulwark. A chain or other device should be provided to fit across the ramp when the doors are open.


13 **Freeboard, Draft Marks**

   *i)* The maximum permissible draft at amidships and its corresponding minimum freeboard are to be indicated on both sides of the vessel, amidships.

   *ii)* The minimum freeboard corresponds to the maximum permissible draft at amidships for which the strength and stability of the vessel are approved.

15 **Cargo Handling Equipment**

   For the Certification of cargo handling equipment, see Section 6-2-4 of the *Steel Vessel Rules*. 
PART 5

CHAPTER 12 Fishing Vessels (2001)

SECTION 3 Intact Stability

1 Intact Stability – General

The intact stability of each fishing vessel is to be evaluated and the results for all loading conditions indicated in 5-12-3/7, verifying compliance with the intact stability criteria in 5-12-3/3 and 5-12-3/5 and taking into account the design considerations indicated in 5-12-3/9, are to be submitted.

Loading conditions where the longitudinal intact stability may be critical, (such conditions) are to be investigated.

Where it is desired to use intact stability criteria which differ from the following, special consideration may be given upon submission of the details and service experience.

3 Intact Stability Criteria

3.1 General

The intact stability of the fishing vessel is to meet the criteria in IMO Resolution A.168 (ES.IV) with an additional requirement that the fishing vessel has a minimum range of stability of 60 degrees. These minimum criteria are summarized as follows and in 5-12-3/Figure 1.

3.1.1 The area under the righting arm curve is not to be less than 0.055 meter-radians (10.3 ft-degrees) up to an angle of heel of 30 degrees.

3.1.2 The area under the righting arm curve between the angles of heel of 30 degrees and 40 degrees or between 30 degrees and the angle of downflooding ($\theta_f$), if downflooding occurs at less than 40 degrees, is not to be less than 0.030 meter-radians (5.6 ft-degrees).

3.1.3 The area under the righting arm curve is not to be less than 0.090 meter-radians (16.9 ft-degrees) up to an angle of heel of 40 degrees or the angle of downflooding ($\theta_f$), if this angle is less than 40 degrees.

Note: This criterion requires that the sum of the area under the righting arm curve to 30 degrees and the righting arm curve between 30 degrees and 40 degrees or 30 degrees and the angle of downflooding be greater than 0.090 meter-radians (16.9 ft-degrees). This means that either or both of these areas is to be greater than that specified in 5-12-3/3.1.1 and 5-12-3/3.1.2.

3.1.4 The righting arm is to be at least 0.2 m (0.66 ft) at an angle greater than or equal to 30 degrees.

3.1.5 The maximum righting arm is to occur at an angle of heel preferably exceeding 30 degrees but not less than 25 degrees.

3.1.6 Initial GM is not to be less than 0.35 m (1.15 ft).
3.1.7

As an additional part of this criterion, a minimum range of stability of 60 degrees is to be provided.

3.1.8

For fishing vessels less than 24 m (79 ft), the criteria indicated above will be specially considered.

**FIGURE 1**
Intact Stability Criteria for Fishing Vessels

3.3  Alternate Criteria

Where the vessel’s characteristics are such that the above criteria in 5-12-3/3.1 cannot be met, the following criteria may be used:

3.3.1

The area under the righting arm curve is not to be less than 0.070 meter-radians (13.1 ft-degrees) up to an angle of 15 degrees when the maximum righting arm occurs at 15 degrees, and 0.055 meter-radians (10.3 ft-degrees) up to an angle of 30 degrees when the maximum righting arm occurs at 30 degrees or above. Where the maximum righting arm occurs at angles of between 15 degrees and 30 degrees, the corresponding area under the righting arm curve is to be:

\[
0.055 + 0.001 (30 - \theta_{\text{max}}) \quad \text{meter-radians}
\]

\[
10.3 + 0.187 (30 - \theta_{\text{max}}) \quad \text{ft-degrees}
\]

** \( \theta_{\text{max}} \) is the angle of heel in degrees at which the righting arm curve reaches its maximum.**
3.3.2 The area under the righting arm curve between the angles of heel and 30 degrees and 40 degrees, or between 30 degrees and \( \theta_f \) if this angle is less than 40 degrees, is to be not less than 0.03 meter-radians (5.6 ft-degrees).

3.3.3 The righting arm is to be at least 0.20 m (0.66 ft) at an angle of heel equal to or greater than 30 degrees.

3.3.4 The maximum righting arm is to occur at an angle of heel not less than 15 degrees.

3.3.5 The initial GM is to be not less than 0.35m (1.15 ft).

3.3.6 For fishing vessels less than 24 m (79 ft), the criteria indicated above will be specially considered.

5 Severe Wind and Rolling Criteria

5.1 General

The severe wind and rolling criteria indicated in IMO Resolution A.562 (14) are a measure to determine the ability of a fishing vessel to withstand the effect of beam winds and rolling. The fishing vessel is to meet the criteria contained in A.562 (14) as summarized below and in 5-12-3/Figure 2.

5.1.1 The vessel is assumed to be subjected to a steady wind pressure acting perpendicular to the vessel’s centerline which results in a steady wind heeling arm \( L_{w1} \) The vessel heel to an angle of equilibrium \( \theta_0 \) is not to exceed 16 degrees.

5.1.2 From the resultant angle of equilibrium \( \theta_0 \), the vessel is assumed to roll due to wave action to an angle of roll \( \theta_1 \) to windward.

5.1.3 The vessel is then subjected to a gust wind pressure which results in a gust wind heeling arm \( L_{w2} \).

5.1.4 Under these circumstances, area “b” is to be equal to or greater than area “a”.

5.1.5 Free surface effects are to be accounted for in the standard conditions of loading, as discussed in 5-12-3/7.

5.1.6 The angles in 5-12-3/Figure 2 are defined as follows:

\[
\begin{align*}
\theta_0 & = \text{angle of heel under action of steady wind (i.e., the intersection of the wind heeling arm curve, } L_{w1}, \text{ and the righting arm curve)} \\
\theta_1 & = \text{angle of roll to windward due to wave action} \\
\theta_2 & = \text{angle of downflooding (} \theta_f \text{) or 50 degrees or } \theta_c2, \text{ whichever is less} \\
\theta_3 & = \text{angle of heel at which openings in the hull, superstructures or deckhouses which cannot be closed weathertight immerse. In applying this criterion, small openings through which progressive flooding cannot take place need not be considered as open}
\end{align*}
\]
\( \theta_{c1} = \) angle of first intercept of wind heeling arm curve, \( L_{w2} \), and righting arm curve

\( \theta_{c2} = \) angle of second intercept of wind heeling arm curve, \( L_{w2} \), and righting arm curve

### 5.1.7

The wind heeling arms \( L_{w1} \) and \( L_{w2} \), referred to above, are constant values at all angles of inclination and are to be calculated as shown below:

\[
L_{w1} = \frac{PAZ}{A} \text{ m (ft)}
\]

\[
L_{w2} = 1.5 L_{w1} \text{ m (ft)}
\]

where

\[ P = 0.0514 \text{ t/m}^2 (0.00486 \text{ t/ft}^2) \]

\[ A = \text{projected lateral area of the portion of the vessel and deck cargo above the waterline, m}^2 (\text{ft}^2) \]

\[ Z = \text{vertical distance from the center of } A \text{ to the center of the underwater lateral area or approximately to a point at one half the draft, m (ft)} \]

\[ \Delta = \text{displacement, metric tons (long tons)} \]

### 5.1.8

The angle of roll \( (\theta_l) \) is to be calculated as follows:

\[ \theta_l = 109kX_1X_2\sqrt{rs} \text{ degrees} \]

where

\[ X_1 = \text{factor as shown in 5-12-3/Table 1} \]

\[ X_2 = \text{factor as shown in 5-12-3/Table 2} \]

\[ k = \text{factor as follows:} \]

\[ = 1.0 \text{ for round bilge vessel having no bilge or bar keels} \]

\[ = 0.7 \text{ for a vessel having sharp bilges} \]

\[ = \text{as shown in 5-12-3/Table 3 for a vessel having bilge keels, a bar keel or both} \]

\[ r = 0.73 + 0.6 \frac{OG}{d} \]

with

\[ OG = \text{distance between the center of gravity and waterline, m (ft)} \]

\[ (+ \text{ above gravity, } - \text{ below}) \]

\[ d = \text{mean design draft of the vessel, m (ft)} \]

\[ s = \text{factor as shown in 5-12-3/Table 4.} \]

**Rolling Period**

\[ T = \frac{2.0CB}{\sqrt{GM}} \text{ sec. (SI/MKS units)} \]

\[ T = \frac{1.108CB}{\sqrt{GM}} \text{ sec. (U.S. units)} \]

where

\[ C = 0.373 + 0.023 \left( \frac{B}{d} \right) - 0.043(L/100) \text{ (SI/MKS units)} \]

\[ = 0.373 + 0.023 \left( \frac{B}{d} \right) - 0.000131L \text{ (U.S. units)} \]
The symbols in 5-12-3/Table 1 to 5-12-3/Table 4 and formula for the rolling period are defined as follows:

\[
\begin{align*}
L & = \text{waterline length of the vessel, m (ft)} \\
B & = \text{molded breath amidships of the vessel, m (ft)} \\
d & = \text{mean design draft of the vessel, m (ft)} \\
C_b & = \text{block coefficient} \\
A_k & = \text{total overall area of bilge keels, or area of the lateral projection of the bar keel, or sum of these areas, m}^2 \text{ (ft}^2) \\
GM & = \text{metacentric height corrected for free surface effect, m (ft)}
\end{align*}
\]

The angle of roll for vessels provided with active anti-rolling devices is to be determined without taking into account the operation of these devices. For vessels with anti-roll tanks, the full free surface effect of the tanks is to be used to determine the GM value used in calculating the angle of roll.

**FIGURE 2**
Severe Wind and Rolling Criteria
### TABLE 1

**Values of Factor $X_1$**

<table>
<thead>
<tr>
<th>$B/d$</th>
<th>$X_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 2.4$</td>
<td>1.00</td>
</tr>
<tr>
<td>2.5</td>
<td>0.98</td>
</tr>
<tr>
<td>2.6</td>
<td>0.96</td>
</tr>
<tr>
<td>2.7</td>
<td>0.95</td>
</tr>
<tr>
<td>2.8</td>
<td>0.93</td>
</tr>
<tr>
<td>2.9</td>
<td>0.91</td>
</tr>
<tr>
<td>3.0</td>
<td>0.90</td>
</tr>
<tr>
<td>3.1</td>
<td>0.88</td>
</tr>
<tr>
<td>3.2</td>
<td>0.86</td>
</tr>
<tr>
<td>3.3</td>
<td>0.84</td>
</tr>
<tr>
<td>3.4</td>
<td>0.82</td>
</tr>
<tr>
<td>$\geq 3.5$</td>
<td>0.80</td>
</tr>
</tbody>
</table>

### TABLE 2

**Values of Factor $X_2$**

<table>
<thead>
<tr>
<th>$C_b$</th>
<th>$X_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 0.45$</td>
<td>0.75</td>
</tr>
<tr>
<td>0.50</td>
<td>0.82</td>
</tr>
<tr>
<td>0.55</td>
<td>0.89</td>
</tr>
<tr>
<td>0.60</td>
<td>0.95</td>
</tr>
<tr>
<td>0.65</td>
<td>0.97</td>
</tr>
<tr>
<td>$\geq 0.70$</td>
<td>1.00</td>
</tr>
</tbody>
</table>

### TABLE 3

**Values of Factor $k$**

<table>
<thead>
<tr>
<th>$A/100$</th>
<th>$k$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>1.00</td>
</tr>
<tr>
<td>1.0</td>
<td>0.98</td>
</tr>
<tr>
<td>1.5</td>
<td>0.95</td>
</tr>
<tr>
<td>2.0</td>
<td>0.88</td>
</tr>
<tr>
<td>2.5</td>
<td>0.79</td>
</tr>
<tr>
<td>3.0</td>
<td>0.74</td>
</tr>
<tr>
<td>3.5</td>
<td>0.72</td>
</tr>
</tbody>
</table>

### TABLE 4

**Values of Factor $s$**

<table>
<thead>
<tr>
<th>$T$</th>
<th>$s$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 6$</td>
<td>0.100</td>
</tr>
<tr>
<td>7</td>
<td>0.098</td>
</tr>
<tr>
<td>8</td>
<td>0.093</td>
</tr>
<tr>
<td>12</td>
<td>0.065</td>
</tr>
<tr>
<td>14</td>
<td>0.053</td>
</tr>
<tr>
<td>16</td>
<td>0.044</td>
</tr>
<tr>
<td>18</td>
<td>0.038</td>
</tr>
</tbody>
</table>

(Intermediate values in 5-12-3/Table 1 through 5-12-3/Table 4 should be obtained by linear interpolation.)

### 7 Standard Loading Conditions

#### 7.1 Loading Conditions

The following assumed loading conditions, as a minimum, are to be investigated on each fishing vessel:

##### 7.1.1

Departure condition from port with full fuel, water, stores, ice, fishing gear etc.

##### 7.1.2

Arrival at the fishing grounds with reduced fuel, water and stores and no catch (the amount of fuel, water and stores based on the distance to the fishing area).

##### 7.1.3

At the fishing grounds with reduced fuel, water and stores and 50% catch.

##### 7.1.4

Departure from the fishing grounds with reduced fuel, water, and stores and full catch.
7.1.5 Arrival at home port with 10 percent fuel, water and stores, and full catch including any weights to be lifted or suspended and their effects on stability.

7.1.6 Arrival at home port with 10 percent fuel, water, and stores and 20 percent of full catch.

7.1.7 Other loading conditions in which the vessel may be operated, such as other partial catch and tank loading combinations, with deck loads, using boxes to store fish, while lifting, in ballast and during periods of icing.

7.3 Load Considerations
The following considerations are to be included in assessing loading conditions.

7.3.1 In addition to the loading conditions noted above, loading conditions are to be calculated for any other unusual loads or operating practices not considered by the criteria which may have an effect on the vessel being designed.

7.3.2 Operating conditions which may seriously impair the stability of the vessel should be brought to the attention of the operator and recommended practical corrective measures are to be included in the stability information furnished to the operator.

7.3.3 When calculating operating conditions, the weight of all fishing gear on deck in that condition (i.e., wet nets, tackle, pots, traps, etc.) is to be included.

7.3.4 The cargo may be assumed to be homogeneous unless this is inconsistent with practice.

7.3.5 Deck cargo is to be included.

7.3.6 Free water in ballast tanks or fish wells is to be included if it is present in normal operations.

7.3.7 If normal practice is to stow fish so that one end of the hold is loaded higher, then the increase in VCG is to be accounted for.

9 Design and Operating Factors Affecting Stability
The following design considerations, environmental forces and operating conditions which affect the stability of each fishing vessel are to be considered when developing the stability calculations and appropriate instructions are to be included in the stability information furnished to the master.

9.1 Lightship and the Inclining Experiment
9.1.1 The first vessel in a class of vessels is to be inclined. Because minor changes to vessels may significantly affect their stability, a deadweight survey is to be conducted on each sister vessel to confirm the lightship characteristics. After accounting for known weight changes, if the deadweight survey shows the displacement differs by more than 1 percent from that of the lead vessel or if the longitudinal center of gravity (LCG) differs by more than 0.5 percent of the length between perpendiculars, the vessel is to be inclined.
Because a fishing vessel may not be built strictly in accordance with the lines plan, and to insure an accurate stability analysis, a verification is to be made to confirm that the vessel was actually built to the lines plan by checking the dimensions of the vessel at several locations at or before the time of the inclining.

ABS Guidelines “Inclining Experiment and Lightweight Survey”, provides information on how to conduct stability tests. These guidelines are to be followed to obtain accurate test data results. It is important that when an inclining experiment is conducted on a hard chine vessel, the chine must be immersed at all times because of the rapid change in waterplane area and thus the height of metacenter, KM, if the chine emerges when the vessel is heeled.

9.3 Calculation of Righting Arms

9.3.1 The hull designs of fishing vessels, with house forward and working areas aft, generally cause the vessel to change draft and trim significantly as it is heeled. Righting arms are to be determined assuming the initial trim and using constant trimming moments (free trim).

9.3.2 In calculating righting arms for loading conditions, the sensitivity of the righting arms to trim is to be determined. If the righting arms are affected by trim, then they are to be calculated for the actual trim for each loading condition, instead of using the zero trim righting arms for all loading conditions.

9.3.3 Superstructures and deck houses are to be included in the buoyant volume if all openings in the sides and ends are weathertight, and all portlights and windows have deadlight covers.

9.3.4 Stern ramps are to be deducted from the buoyant volume.

9.3.5 Bulwarks are not to be included in the buoyant volume.

9.3.6 In general, volumes which are watertight and of sufficient strength can be considered fully effective. All fully effective volumes may be included in the buoyant volume for the righting arm calculations, although the exclusion of these volumes permits a more accurate assessment of the vessel’s stability characteristics.

9.5 Effect of Trim

9.5.1 Consideration is to be given to the effect of trim that large buoyant volumes at one end of the vessel can cause. A large number of vessels with deckhouses forward trim substantially when heeled due to the higher distribution of reserve buoyancy at the bow.

9.5.2 Where the trim in the loading conditions is different from that for which the righting arms were calculated, additional righting arms are to be calculated for these loading conditions.

9.5.3 In addition, as a vessel trims consideration is to be given to the position of the point of downflooding relative to the waterline, thus allowing downflooding to occur sooner than expected.
9.7  Free Surface Effects

The free surface effect is a major consideration for many fishing vessels. Because of this, the following is recommended to account for the free surface effect:

9.7.1  
For all conditions, the initial metacentric height and righting arm curves are to be corrected for the effect of free surfaces of liquids in tanks by calculating the following:

9.7.1(a) For each type of consumable liquid, the free surface effect of at least one transverse pair of wing tanks or a single centerline tank having the greatest free surface effect.
9.7.1(b) The free surface effect of each partially filled tank containing other than consumable liquids.
9.7.1(c) The free surface effect of passive roll stabilization tanks.

9.7.2  
Either the standard free surface calculation, based on the moment of inertia of the tank, or the moment of transference method may be used.

9.7.3  
Because of the large free surface moment, vessels with large fish wells are to maintain these wells in either empty or fully pressed up condition. A check of the transition period at sea is to be completed if ballasting at sea is the practice of the operator.

9.7.4  
The free surface correction for pairs of tanks fitted with cross connection piping but without valves such as passive roll stabilization tanks are to be calculated assuming the tanks are one common tank.

9.9  Treatment of Lifting Weights and Heeling Moments Due to Fishing Gear

9.9.1  
When a weight is lifted from the deck, the weight then acts at the tip of the boom and is to be considered in developing the VCG and the righting arm curves.

The stability information shall contain the details of the lifting gear including the maximum heeling moments and other information for the crew to minimize the possibility of exceeding the design condition.

9.9.2  
The moment caused by the lifting of a fishing net filled with catch is to be considered in developing the VCG and righting arm curves.

9.9.3  Heeling Moments Due to Fishing Gear

9.9.3(a) The normal heeling moments imposed by trawling or seining, for instance, are to be evaluated by the designer and included in the stability analysis.
9.9.3(b) The heeling moments which would be experienced by a trawler in normal operations as well as when the vessel is attempting to clear a trawl which was snagged or fastened to the bottom is to be investigated. The residual righting area between the heeling arm curve and the righting arm curve is to be at least 0.080 meter-radians (15 foot-degrees) to the least of the following angles.

i) Angle of maximum righting arm

ii) Angle of downflooding

iii) 40 degrees

9.9.3(c) In addition, the static angle of heel is not to exceed 10 degrees.
9.9.3(d) This is illustrated in 5-12-3/Figure 3. The heeling moment is the maximum generated based on the allowed combinations of hook load and radius. The heeling arm curve is defined by:

\[ A = \text{maximum heeling moment} \times \frac{\cos \theta}{\Delta} \]

In calculating the righting arm curve, the increase in VCG due to the lifting of the weight shall be considered.

9.9.3(e) The effect of a trawl snagging on the bottom is to be considered. When the trawl becomes snagged the potential heeling moment can exceed the righting moment. 5-12-3/Figure 4 shows a family of heeling moment curves for a given propeller thrust and vessel trawl geometry imposed on a righting arm curve. The illustration is not intended to be numerically specific, but is instead presented to show how operational practices must be considered in developing stability information. The heeling moment increases for decreasing trawl angles \( a \), where \( a \) is the angle which the trawl angle, which is in turn a function of the wire length and the water depth. Since normal practice is to shorten up the trawl wire and use power to break the trawl free, the angle at which the wire trails can be significantly reduced as the vessel moves towards the location of the snag. If the stability is critical consideration should be given to the need for quick-release devices on winches and other lifting equipment. The stability information should warn the operators that attempting to release a fastened trawl by rapidly increasing the engine thrust or suddenly increasing the power on the winch may cause the vessel to capsize.

**FIGURE 3**
Lifting Criteria

Angle of Equilibrium
< 10 deg

Angle of Max. R.A.

Angle of Downflood

Max. Heeling Moment * \( \cos \theta/\Delta \)

Heel Angle - Degrees

Area \( \geq 0.080 \text{ m-rad}^2 \)

(15.0 ft-deg) \( \geq 2 \)
9.11 Ballast

9.11.1

Ballast is normally used to improve the stability of the vessel. However, depending on the location of the ballast, it can either raise or lower the center of gravity of a vessel. Ballast may also decrease the reserve buoyancy of a given vessel and can adversely change the trim of the vessel.

9.11.2

If it is the intent to ballast during ballast operations the free surface effect will exist during the interim period until the ballast tank is pressed up is to be considered in developing the stability data.

9.11.3

If permanent ballast is installed, it is not to be removed without notifying ABS and evaluating the effect on stability.
9.13 Watertight Integrity and Flooding

9.13.1

The importance of providing watertight closures that can be quickly closed and easily maintained is to be considered in developing a hull which can meet or exceed the stability criteria and provide an efficient fishing platform.

9.13.2

All closures which must be opened at sea are to be kept as far inboard and as high as possible in order to maximize the angle at which downflooding occurs. Doors in forecastle, poop, and deckhouse end bulkheads are often located near the side of the vessel and could be immersed at low angle of heel. Wherever possible these closures are to be kept close to the centerline, then the angle of downflooding is considerably increased with a resultant increase in safety.

9.13.3

Instructions to the master are to be provided to keep all watertight closures closed except when actually being used. These closures should be clearly labeled “KEEP CLOSED”. A diagram showing the location to all watertight closures is to be placed aboard the vessel in the Stability Information provided to the operator. An example of this is shown in 5-12-3/Figure 5.

**FIGURE 5**
Diagram of Key Watertight Closures
9.15 **Icing**

The following guidance, which is derived from IMO, is offered for consideration:

9.15.1

The vessel’s stability is to be investigated in the worst conditions of loading given in 5-12-3/7.

9.15.2

If the vessel operates in areas where ice accretion is likely to occur, the following minimum weights of ice are to be assumed:

i) The weight of ice on all horizontal surfaces is to be at least 30 kg/m² (6.14 lbs/ft²).

ii) The weight of ice of the projected vertical area above the waterline is to be at least 15 kg/m² (3.07 lbs/ft²).

iii) Plans showing projected horizontal and vertical areas are to be submitted.

9.15.3

The weight of ice for other geographical areas should be assumed to vary from one half to twice of these values or that recommended by the administration where the vessel is intended to operate, such as the Transport Canada – Marine Safety requirements for vessels operating in their waters.

9.15.4

The height of the center of gravity of the accumulated ice is to be located according to the position of the corresponding horizontal surfaces (decks and gangways) and other continuous surfaces on which ice can reasonably expected to accumulate. The projected lateral area of small discontinuous surfaces such as rails, spars, and rigging with no sails can be accounted for by increasing the calculated area by 5 percent and the static moments of the area by 10 percent.

9.17 **Water on Deck**

The IMO Guidance as a means of evaluating the residual stability of the vessel with water on deck is repeated below.

9.17.1

The ability of the vessel to withstand the heeling effect due to the presence of water on deck is to be demonstrated by showing that with the vessel in the worst operating condition, the ratio of area “b” to area “a” shown in 5-12-3/Figure 6 is not to be less than 1.0. That is, it satisfies the following equation in the worst operating condition:

\[
C_{wod} = \frac{\text{area } "b"}{\text{area } "a"} \geq 1.0
\]

9.17.2

The angle which limits area “b” is to be equal to the downflooding angle \( \theta_f \) or 40 degrees, whichever is less.

9.17.3

The value of the heeling moment \( M_{wod} \) (or the corresponding heeling arm) due to the presence of water on deck is to be determined assuming that the deck well is filled to the top of the bulwark at its lowest point and the vessel heeled up to the angle at which this point is immersed (see 5-12-3/Figure 7).

9.17.4

When calculating \( M_{wod} \) the following assumptions are to be made:

i) At the beginning the vessel is in upright position;

ii) During heeling, trim and displacement are constant and equal to the values for the vessel without water on deck;

iii) The effect of freeing ports should be ignored.
9.17.5
The above provisions may be adjusted, taking into account the seasonal weather conditions and sea states in the areas in which the vessels will operate, the type of vessel and its mode of operation.

9.17.6
Other methods for the calculation of the effect of water on deck using the dynamic approach may be adopted.

**FIGURE 6**
Method of Treatment of Water on Deck

**FIGURE 7**
Volume of Water to be Included in Calculating Effect of Water on Deck

*Note:* Deck is filled to top of gunwale and gunwale is immersed.
1 Wire Rope

Both anchor chains may be replaced with wire rope, having strength not less than the required tabular Grade 1 chain, on vessels less than 30 m (98.4 ft) in length. Wire rope having strength not less than the required tabular Grade 1 chain, may be used in lieu of the chain cable of one anchor on vessels between 30 m (98.4 ft) and 40 m (131.2 ft) in length, provided normal chain cable is provided for the second anchor. In general, wire ropes of trawl winches may be used to comply with the anchor cable requirement in this paragraph. Where wire ropes are substituted for anchor chain, the length of the wire rope is to be 1.5 times that of the chain it is replacing. A short length chain cable of the required size is to be fitted between the wire rope and the anchor, having a length of 12.5 m (41 ft) or the distance between anchor in stowed position and winch, whichever is less.
PART 5

CHAPTER 12 Fishing Vessels (2001)

SECTION 5 Machinery Equipment and Systems

1 Inclinations

Main propulsion and all auxiliary machinery essential to the operation of the vessel is to be capable of operating with the vessel upright or inclined transversely to 15 degrees either way under static conditions and up to 22.5 degrees under dynamic conditions or inclined longitudinally up to 7.5 degrees statically or dynamically or combination of these conditions. The Administration may permit deviation from these angles, taking into consideration the type, size and service conditions of the vessel.

For Emergency Equipment and Switchgear refer to 4-1-1/17.

3 Liquid Petroleum Gas

Where liquid petroleum gas is used in the galley, the installation is to comply with a recognized standard, such as 46CFR-Subpart 58.16. Liquefied or non-liquefied combustible gas containers used for heating or cooking are considered ship’s stores and are not covered in these Rules.

5 Electrical Installation

5.1 General

On vessels whose length is less than 30 m (100 ft) and the main engines are self-sustaining and no mechanical refrigeration is required for the catch, only one generator will be required.

5.3 Emergency Lighting

In addition to the 4-6-2/5.3, emergency lighting is to be provided in fish handling and fish processing spaces.

5.5 Cables – Construction

Cables are to be constructed and sized in accordance with a recognized standard. They are to be suitable for marine application, flame retardant and have copper conductors of stranded type, except sizes need exceeding 1.5 mm² (16 AWG) may have solid conductors. Refer also to 4-6-4/13.1.

7 Refrigeration Plant

The refrigeration plant is to be in accordance with Part 6, Chapter 2 of the Steel Vessel Rules. For spaces containing toxic refrigerants, see Section 6-2-11 of the Steel Vessel Rules. However, where separated spaces for toxic refrigerants are not practicable, the refrigerating machinery may be installed in the machinery spaces provided that in addition to the leak detection and water spray systems special consideration is given to the ventilation arrangements, appropriate gas detectors are fitted, protection of the refrigeration machinery from damage and provided that the propulsion machinery and essential auxiliaries can be operated from the navigation bridge.
PART 5

CHAPTER 12 Fishing Vessels (2001)

SECTION 6 Surveys

1 Surveys After Construction (2005)

The surveys after construction are to be carried out in accordance with the ABS Rules for Surveys After Construction (Part 7).
APPENDIX 1 Requirements for Building and Classing Vessels Intended for Service in Domestic Waters

Note: This Appendix is prepared to make provision for users of the Rules to design, build and operate vessels intended solely for restricted service in domestic waters. It is recommended that any vessel which may possibly change its service area from domestic to international at a future date should at least comply with the requirements listed in 5-A1/3.1, as applicable, so that the upgrading work for compliance with SOLAS, etc. will avoid essential conversion of the vessel’s structural arrangements.

1 General (1 July 2010)

For a vessel intended for service in domestic waters, ABS will consider the Flag Administration’s Ships Safety Regulations as an alternative in satisfying specific areas of the Rules. Where approved by the Committee for a particular service, the vessel will be classed and distinguished in the Record by the symbols A1 followed by class notation, (Operational Area) Domestic Service, (e.g., A1 U.S. Domestic Service, etc.).

3 Requirements Replaced with National Regulations

The following requirements in the Rules may be replaced with the Regulations of the Flag Administration for those vessels intended solely for service in domestic waters:

3.1 Basic Construction (2010)

<table>
<thead>
<tr>
<th>Section/Paragraph</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-2-4/1</td>
<td>Double Bottom</td>
</tr>
<tr>
<td>Section 3-2-7</td>
<td>Extra Bulkheads for Subdivision</td>
</tr>
<tr>
<td>3-2-7/7</td>
<td>Watertight Door on W.T. Bulkhead</td>
</tr>
<tr>
<td>Section 3-4-1</td>
<td>Structural Fire Protection</td>
</tr>
<tr>
<td>4-5-2/9, 4-5-2/11 &amp; 4-5-3/3.1</td>
<td>Fixed Fire Fighting System in Engine Room</td>
</tr>
<tr>
<td>4-6-2/5</td>
<td>Emergency Generator Room</td>
</tr>
</tbody>
</table>

3.3 Machinery and Equipment

<table>
<thead>
<tr>
<th>Section/Paragraph</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-2-1/3.3, 4-2-1/9.7, 4-2-1/11.7</td>
<td>Spare Pumps</td>
</tr>
<tr>
<td>4-6-2/5</td>
<td>Emergency Power</td>
</tr>
<tr>
<td>4-6-2/5.9</td>
<td>Emergency Switchboard</td>
</tr>
<tr>
<td>4-5-2/5.3</td>
<td>Emergency (Second) Fire Pump</td>
</tr>
<tr>
<td>Part 4, Chapter 7</td>
<td>Shipboard Automation <em>(1)</em></td>
</tr>
</tbody>
</table>

Note: 1 The applicable requirements in Part 4, Chapter 7 are to be fully complied with when the shipboard automation notation ACCU or ABCU is requested.