Stability Standards & Regulations

General Application

- All new existing and modified fishing vessels up to 24 metres in length.

- The authorized representative of a fishing vessel shall ensure that the required criteria as stipulated in these Regulations and TP XXX are satisfied in all respects.
Stability Standards & Regulations

Specific Application:

- Vessels 12-24 metres must conduct an inclining experiment, submit a stability booklet and comply with the intact stability criteria set out in TP XXX, Part A, in the following situations:
  a) >15 metres in length
  b) Engaged in trawling, dredging and purse seining
  c) Bulk carriage of herring or capelin
  d) Carriage of liquid cargo
  e) Beyond Group 3 voyages
  f) Operating between 01 December and 31 March inclusive, in area where ice accretion is likely to occur;
  g) Multiple decks
  h) Roll period tests do not comply with the minimum criteria
  i) Cockpits or wells are fitted in the freeboard deck or
  j) Anti-rolling tanks.

- In all other situations, the fishing vessel must satisfy the simplified stability test & criteria set out in TP XXX, Part B.

Stability Standards & Regulations

Specific Application

- Vessels < 12 metres must conduct an inclining experiment, submit a stability booklet and comply with the intact stability criteria set out in TP XXX, Part A, in the following situations:
  a) Engaged in trawling, dredging and purse seining or where heavy gear is towed
  b) Beyond Group 3 voyages
  c) Operating between 01 December and 31 March inclusive, in area where ice accretion is likely to occur;
  d) Multiple decks
  e) Roll period tests do not comply with the minimum criteria
  f) Anti-rolling tanks

- In all other situations, the fishing vessel must satisfy the simplified stability test & criteria set out in TP XXX, Part B.
Stability Regulations

Stability Test Assessment

- The authorized representative of a new, existing or a modified fishing vessel shall ensure that:

1. The simplified stability test is conducted by a marine inspector or
2. The inclining experiment is witnessed by a marine inspector and conducted and endorsed by:
   a) A Professional Engineer
   b) A Naval Architect or
   c) Any other person approved by the Minister.

Stability Regulations

Stability Documentation

- The stability booklet shall be endorsed and stamped compliant by:
  a) A Professional Engineer
  b) A Naval Architect or
  c) Any other person approved by the Minister.

- A certified copy of Stability booklet shall be provided to the Master of the vessel and to TCMS for auditing purposes.
Stability Regulations

Markings

- All fishing vessels shall be marked in accordance with the requirements of the Stability Standards and Regulations.

- The vessel markings corresponding to the maximum allowable displacement of the vessel shall be:
  
  a) As specified in the Stability booklet and the Certificate of Safety for the vessel
  
  b) Located amidships, port and starboard sides of the hull and
  
  c) 300mm in length and 30mm in height of a colour contrasting that of the hull and permanently fixed.

Compliance

- All new construction on the date of issuing the Stability Standards and Regulations

- All existing fishing vessels three years after the date of issuing the Stability Standards and Regulations
Stability Regulations

Exemptions

➢ Where existing fishing vessels can not meet the new stability requirements, the authorized representative shall demonstrate that the proposed modifications necessary to meet the requirements will adversely affect the stability of the vessel.

➢ Notwithstanding any new fishing vessels shall comply with the new stability requirements.

Periodic Displacement Survey

➢ At periodic intervals not exceeding five years, the periodic displacement survey shall be witnessed by a marine inspector and conducted and endorsed by:

   a) A Professional Engineer

   b) A Naval Architect or

   c) Any other person approved by the Minister.

➢ Where the lightship displacement deviates more than 2% or where the longitudinal centre of gravity deviates more than 1% of L, the vessel shall be subject to a new stability analysis.
Stability Standard, Part A – Intact Stability Criteria

Design Stability Criteria

- **Maximum permissible operating draft**: Equal to the maximum load condition but never less than 0.4m

- **Flooding points**: > 40 degrees for hatch covers, watertight doors & engine room vents

- **Bow height**: > 0.107 x k x L, where k =1

Stability Standard, Part A – Intact Stability Criteria

Design Stability Criteria (continued)

- **Deck cargo**: The shipowner must report the value of the maximum mass resulting from storage on the deck or of the maximum catches likely to be taken in one operation.

- **Effect of Trim**: The righting lever arms are to be calculated for all loading conditions on a free to trim basis.

- **Free Surface Effects**: The free surface effect of all tanks, fish wells and roll stabilization tanks must be calculated for each loading condition.
GZ curve area: The area under the righting lever curve (GZ curve) is to be not less than 0.1 m-rad up to $q = 40$° angle of heel.

Minimum righting lever: The righting lever GZ is to be at least 0.25 m at an angle of heel equal to or greater than 30°.

Angle of maximum righting lever: The maximum righting lever arm is to occur at an angle of heel preferably exceeding 30° but not less than 25°.

Initial metacentric height: 
$GM_0 \geq 0.45$ m for all loading conditions. 
$GM_0$ is to be positive for the lightship condition.

Range of positive stability: A minimum range of stability of 60 degrees is to be provided for each loading condition.
The owner of any existing fishing vessel that does not comply with the design and general intact stability criteria set in Section 5 must comply with the alternate intact stability criteria.

**Stability criteria**

- Icing considerations
- Severe wind and rolling criteria
- Water on deck criteria
- Treatment of lifting weights and heeling moments due to fishing gear.

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**Stability Standard, Part B – Simplified Stability Criteria**

**Scope**

- Provides a minimum level of safety for Group 3 voyages in coastal waters, where conditions up to wind force 6 and significant wave heights up to 2 m may be experienced.

**Application**

- < 24 meters that are not required to conduct an inclining experiment.
### Terms and Definitions (summary)

<table>
<thead>
<tr>
<th>Type</th>
<th>Particularity</th>
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<tr>
<td>Closed vessel</td>
<td>• Freeboard 1/10 B.</td>
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<td></td>
<td>• Freeing ports 7%.</td>
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<tr>
<td>Open vessel type 1</td>
<td>• Buoyancy materials</td>
</tr>
<tr>
<td></td>
<td>• Deck, cockpit, wells; not watertight.</td>
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<td>• Mechanical drainage.</td>
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<tr>
<td>Open vessel type 2</td>
<td>• Quick draining by gravity.</td>
</tr>
<tr>
<td></td>
<td>• Cockpit or well bottom at 1/20 B.</td>
</tr>
<tr>
<td></td>
<td>• Deck, cockpit, wells; watertight.</td>
</tr>
<tr>
<td></td>
<td>• Watertight opening with sill.</td>
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</tbody>
</table>

### Vessel of closed construction

A **vessel of closed construction** means a vessel having a fixed watertight deck structure covering the entire length of the hull above the deepest operating waterline. When open wells or cockpits are fitted in the deck of the ship, it is considered to be of closed construction if flooding of the open wells or cockpits does not endanger the vessel. (See Figure 1).
Stability Standard, Part B – Simplified Stability Criteria

Terms and Definitions (continued)

- The following conditions define a Closed vessel for the purposes of simplified stability:

1. The height of the watertight deck structure above the deepest operating waterline must be a minimum of 1/10 of the breadth of the vessel.

2. If the deck is bounded by bulwarks, the bulwarks must be fitted with freeing ports. The size of the freeing ports shall be 7% of bulwark area, each side.

Figure 1: Vessel of closed construction

Stability Standard, Part B – Simplified Stability Criteria

- Maximum authorized load
- Simplified Stability Criteria & Tests

- Roll period test; \( T < 1.25 \times B \)
- Heeling test

- Loaded WL
- Operational WL
- FREEMAN & OPEN

Test & Criteria results:

- Maximum authorized load = 10091 kg
- Measured operational lightship freeboard \( FB_{\text{MIN}} \) = 138 cm
- Displacement \( d \) per centimetre immersion = \( 7 \times L \times B \) (in kg, \( L \) and \( B \) in meters)
- Displacement = 22 kg/cm

Feeding to find the fully loaded condition:

- 200 Crabs Pots & Ice = 10091 kg
- Freeboard in the fully loaded condition \( FB_{\text{LOAD}} \) = 116 cm
- Maximum authorized load = 10091 kg

Transport Canada
Marine Safety
**Stability Standard, Part B – Simplified Stability Criteria**

**Terms and Definitions:**
- **Vessel of open construction** means a vessel other than a vessel of closed construction;
- **Open vessel type 1** means a vessel of open construction where the following conditions exist: (See Figures 2, 3, 4.)

1. The vessel is fitted with buoyancy material which meets the requirement of the reserve of buoyancy and flotation test.
2. The deck, cockpit or well bottom are open to the bilge.
3. The deck, cockpit or well can not drain overboard in all loading conditions.

**Figure 2: Open vessel type 1**

- Simplified Stability Criteria & Test results:
  1. Maximum authorized load = 871 kg
  2. Minimum downflooding height = 0.16 m
  3. Minimum downflooding angle = 25°

- Transport Canada Marine Safety
3. Minimum downflooding angle = 25°
2. Minimum downflooding height = 0.2 x B
1. Maximum authorized load = 100 x L x B x D (Kg)

Simplified Stability Criteria & Test:
4. Reserve of buoyancy
5. Roll period test; T < 1.25 X B
6. Heeling test; Residual freeboard > 1/2 x Load freeboard

Figure 3: Open vessel type 1

Figure 4: Open vessel type 1

Stability Standard, Part B – Simplified Stability Criteria

Stability Standard, Part B – Simplified Stability Criteria
Open vessel type 2 means a vessel of open construction where the following conditions exist: (See Figures 5, 6, 7.)

1. The vessel is fitted with a quick draining cockpit or well.

2. The cockpit or well bottom height above the deepest operating water line must be at a minimum of 1/20 of the breadth of the vessel.

3. The cockpit or well bottom must be watertight and the bulwarks fitted with scuppers or freeing ports equivalent to the requirements of section 14.

4. Any opening within the cockpit area leading to an interior space of the hull must be fitted with a watertight closing appliance and sill.
Stability Standard, Part B – Simplified Stability Criteria

Figure 6: Open vessel type 2

Figure 7: Open vessel type 2
For closed vessels, the minimum freeboard \( (FB_{MIN}) \) measured amidships shall be equal to or greater than \( 1/10 \) of the breadth \( (B) \) of the vessel in the fully loaded condition.

For open vessels type 2, the minimum height \( (H_{B,min}) \) of the bottom cockpit or well measured amidships, shall be equal to or greater than \( 1/20 \) of the breadth \( (B) \) in the fully loaded condition.

Should hydrostatic data for the vessel be unavailable, the following approximate formula may be used to obtain the displacement \( (d) \) per centimeter immersion in the operational lightship condition.

\[
d = 7 \times L_{WL} \times B \quad (d \text{ in kg, } L_{WL} \text{ and } B \text{ in metres})
\]

In order to check the compliance with the freeboard rule the above calculation will give the approximate submersion of the vessel after all weights corresponding to the fully loaded condition have been added to the operational lightship condition.
For Open Vessel type 1:

- the maximum authorized load is to be determined by the following formula:

\[ M_{\text{Load}} (\text{kg}) = 100 \times L_{\text{OA}} \times B \times D \]

- the minimum downflooding height shall not be lower than 0.2 of B in the fully loaded condition.

- the minimum downflooding angle shall not be less than 25 degree in the fully loaded condition.

For Open Vessel type 2:

- A cockpit, well or deck bounded with bulwark shall only be drained by gravity, and does not consider draining by pumping or any other method.

- A quick-draining cockpit shall have at least two drains, one port and one starboard.

- The draining time shall be determined either by measurement of the actual draining time, or by direct calculation including head losses.
Stability Standard, Part B – Simplified Stability Criteria

Reserve Buoyancy, Open Vessel type 1

**General:**

- Vessels shall be fitted with sufficient buoyancy materials to keep the vessel from sinking when it is swamped and pass the flotation and stability test.
- This reserve buoyancy shall be judiciously distributed to keep the vessel afloat.
- The center of volume of all buoyancy materials should be higher than the vertical center of gravity of the vessel.
- For wooden vessels, this calculation may take into account the inherent buoyancy of this material to half of its value.

**Stability Standard, Part B – Simplified Stability Criteria**

Reserve Buoyancy, Open Vessel type 1

**General:**

- On wooden or GRP-hulled vessels, the buoyancy volumes shall be filled with marine closed-cell foam material.
- Buoyancy materials shall be installed in watertight compartments.
- Metal-hulled double-bottom vessels that are divided longitudinally into three compartments are not required to install foam material.
- Buoyancy materials shall be securely fastened to the vessel to withstand any motion they may develop; they shall be protected against impacts or chafing and shall be resistant to hydrocarbons.
**Stability Standard, Part B – Simplified Stability Criteria**

**Reserve Buoyancy, Open Vessel type 1**

**Calculation for Floatation Requirements:**

- Amount of buoyancy material needed to support the swamped vessel and fittings other than engine and related equipment (Fb)

- Amount of buoyancy material needed to support the propulsion machinery (Fp)

- Amount of buoyancy material needed to support the maximum authorized load (Fl)

**Buoyancy and stability test**

- A buoyancy test shall be performed in the presence of a marine inspector.

- A quarter of the maximum authorized load shall be simulated by bags of sand.

- A swamping test shall be conducted to find a hydrostatic level between the outside and the inside.

- The residual stability shall be sufficient for a weight of 15 kg affixed to the gunwale amidships not to capsize the vessel.

- This test dispenses with the requirement to supply the supporting calculations and distribution plans.
Stability Assessment

Roll period test

- The initial stability shall be determined by the roll period method.

- To consider the estimated initial stability satisfactory in any operational lightship condition, the calculated value of T, in seconds, should not be more than 1.25 B.

- If the calculated value of T, in seconds, is more than 1.25 B, an inclining experiment shall be conducted and the GM shall be $>$ than 0.45 meters;

- If the GM is $<$ than 0.45 meter, a stability analysis shall be performed according to Part A of the Stability Standard.

Stability Assessment

Heeling test:

- Where pot haulers or other lifting appliances are installed, a heeling test shall be conducted.

- During the load lifting and maximum outreach test, the vertical traction shall not cause submersion of the deck line amidships on a closed vessel or a reduction of more than 50 per cent of the freeboard measured prior to the operation on an open vessel.
Thank you

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