Chapter 1
General

1.1 Application

1.1.1 The criteria stated under chapter 2 of this part present a set of minimum requirements that shall apply to cargo and passenger ships of 24 m in length and over. For containerships of 100 m in length and over, criteria alternative to section 2.2 of this part may be applied.* Offshore supply vessels and special purpose ships are not required to comply with provisions of section 2.3. For such vessels, compliance with an equivalent alternative criteria† shall be demonstrated.

1.1.2 The criteria stated under chapter 3 of this part are special criteria for certain types of ships. For the purpose of part A the definitions given in the introduction apply.

1.2 Dynamic stability phenomena in waves

Administrations shall be aware that some ships are more at risk of encountering critical stability situations in waves. Necessary precautionary provisions may need to be taken in the design to address the severity of such phenomena. The phenomena in seaways which may cause large roll angles and/or accelerations have been identified hereunder.

Having regard to the phenomena described in this section, the Administration may for a particular ship or group of ships apply criteria demonstrating that the safety of the ship is sufficient. Any Administration which applies such criteria should communicate to the Organization particulars thereof. It is recognized by the Organization that performance-oriented criteria for the identified phenomena listed in this section need to be developed and implemented to ensure a uniform international level of safety.

1.2.1 Righting lever variation

Any ship exhibiting large righting lever variations between wave trough and wave crest condition may experience parametric roll or pure loss of stability or combinations thereof.

1.2.2 Resonant roll in dead ship condition

Ships without propulsion or steering ability may be endangered by resonant roll while drifting freely.

1.2.3 Broaching and other manoeuvring-related phenomena

Ships in following and quartering seas may not be able to keep constant course despite maximum steering efforts, which may lead to extreme angles of heel.

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* The provisions of section 2.3 of part B may be applied as an alternative.

† For offshore supply vessels, the provisions of section 2.4 of part B may be applied as an alternative to the application of section 2.2 of this part. For special purpose ships, provisions of section 2.5 of part B may be applied as an alternative to the application of section 2.2 of this part.

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Chapter 2
General criteria

2.1 General

2.1.1 All criteria contained in this part shall be applied for all applicable conditions of loading.*

2.1.2 Free surface effects† shall be accounted for in all conditions of loading.*

2.1.3 Where anti-rolling devices are installed in a ship, the Administration shall be satisfied that the criteria can be maintained when the devices are in operation and that failure of power supply or the failure of the device(s) will not result in the vessel being unable to meet the relevant provisions of this Code.

2.1.4 A number of influences such as icing of topsides, water trapped on deck, etc. adversely affect stability, and the Administration is advised to take these into account, so far as is deemed necessary.

2.1.5 Provisions shall be made for a safe margin of stability at all stages of the voyage, regard being given to additions of weight, such as those due to absorption of water and icing‡ and to losses of weight, such as those due to consumption of fuel and stores.

2.1.6 Each ship shall be provided with a stability booklet, approved by the Administration, which contains sufficient information§ to enable the master to operate the ship in compliance with the applicable requirements contained in the Code. If a stability instrument is used as a supplement to the stability booklet for the purpose of determining compliance with the relevant stability criteria, such instrument shall be subject to approval by the Administration.¶

2.1.7 If curves or tables of minimum operational GM (metacentric height) or maximum VCG (vertical centre of gravity) are used to ensure compliance with the relevant intact stability criteria, those limiting curves shall extend over the full range of operational trims, unless the Administration agrees that trim effects are not significant. When curves or tables of minimum operational metacentric height (GM) or maximum centre of gravity (VCG) versus draught covering the operational trims are not available, the master must verify that the operating condition does not deviate from a studied loading condition, or verify by calculation that the stability criteria are satisfied for this loading condition taking into account trim effects.

2.2 Criteria regarding righting lever curve properties

2.2.1 The area under the righting lever curve (GZ curve) shall not be less than 0.055 m·rad up to $\varphi = 30°$ angle of heel and not less than 0.09 m·rad up to $\varphi = 40°$ or the angle of down-flooding φ_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 φ_f, if this angle is less than 40°,

* Refer to sections 3.3 and 3.4 of part B, for the conditions of loading to be considered.

† Refer to section 3.1 of part B.

‡ Details regarding ice accretion are given in chapter 6 (Icing considerations) of part B.

§ Refer to section 3.6 of part B.

¶ Refer to chapter 4 (Stability calculations performed by stability instruments) of part B.

shall not be less than 0.03 m·rad. The angle φ_f is an angle of heel at which openings in the hull, superstructures or deck-houses which cannot be closed weathertight immerse. Small openings through which progressive flooding cannot take place need not be considered as open.

2.2.2 The righting lever (GZ) shall be at least 0.2 m at an angle of heel equal to or greater than 30°.

2.2.3 The maximum righting lever shall occur at an angle of heel not less than 25°. If this is not practicable, alternative criteria, based on an equivalent level of safety,* may be applied subject to the approval of the Administration.

2.2.4 The initial metacentric height GM_0 shall not be less than 0.15 m.

2.3 Severe wind and rolling criterion (weather criterion)

2.3.1 The ability of a ship to withstand the combined effects of beam wind and rolling shall be demonstrated, with reference to figure 2.3.1-1, as follows:

.1 the ship is subjected to a steady wind pressure acting perpendicular to the ship's centreline which results in a steady wind heeling lever (l_{w1});

.2 from the resultant angle of equilibrium (φ_0), the ship is assumed to roll owing to wave action to an angle of roll (φ_1) to windward. The angle of heel under action of steady wind (φ_0) should not exceed 16° or 80% of the angle of deck edge immersion, whichever is less;

.3 the ship is then subjected to a gust wind pressure which results in a gust wind heeling lever (l_{w2}); and

.4 under these circumstances, area *b* shall be equal to or greater than area *a*, as indicated in figure 2.3.1-1 below:

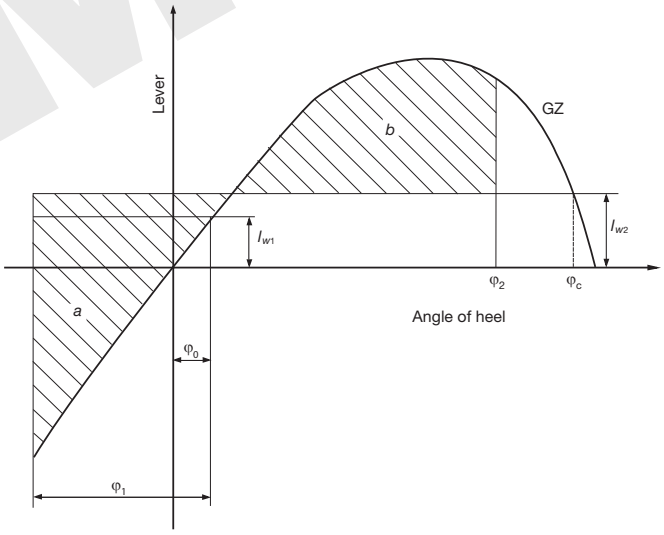


Figure 2.3.1-1 – *Definition of area* a *and area* b

* Refer to the Explanatory Notes to the International Code on Intact Stability, 2008 (MSC.1/Circ.1281) (see page 129 of this publication).

where the angles in figure 2.3.1-1 are defined as follows:

φ_0 = angle of heel under action of steady wind

φ_1 = angle of roll to windward due to wave action (see 2.3.1.2, 2.3.4 and footnote on page 22)

φ_2 = angle of down-flooding (φ_f) or 50° or φ_c, whichever is least,

where:

φ_f = angle of heel at which openings in the hull, superstructures or deck-houses 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.

φ_c = angle of second intercept between wind heeling lever l_{w2} and GZ curves.

SEE INTERPRETATION 2

2.3.2 The wind heeling levers l_{w1} and l_{w2} referred to in 2.3.1.1 and 2.3.1.3 are constant values at all angles of inclination and shall be calculated as follows:

$$l_{w1} = \frac{P \cdot A \cdot Z}{1{,}000 \cdot g \cdot \Delta} \text{ (m) and}$$

$$l_{w2} = 1.5 \cdot l_{w1} \text{ (m)}$$

where:

P = wind pressure of 504 Pa. The value of P used for ships in restricted service may be reduced, subject to the approval of the Administration

A = projected lateral area of the portion of the ship and deck cargo above the waterline (m^2)

Z = vertical distance from the centre of A to the centre of the underwater lateral area or approximately to a point at one-half the mean draught (m)

Δ = displacement (t)

g = gravitational acceleration of 9.81 m/s^2.

2.3.3 Alternative means for determining the wind heeling lever (l_{w1}) may be accepted, to the satisfaction of the Administration, as an equivalent to calculation in 2.3.2. When such alternative tests are carried out, reference shall be made based on the Guidelines developed by the Organization.* The wind velocity used in the tests shall be 26 m/s in full scale with uniform velocity profile. The value of wind velocity used for ships in restricted services may be reduced to the satisfaction of the Administration.

* Refer to the Interim Guidelines for alternative assessment of the weather criterion (MSC.1/Circ.1200) and its Explanatory Notes (MSC.1/Circ.1227).

2.3.4 The angle of roll (φ_1) referred to in 2.3.1.2 shall be calculated as follows:

$$\varphi_1 = 109 \cdot k \cdot X_1 \cdot X_2 \cdot \sqrt{r \cdot s} \text{ (degrees)}$$

where:

X_1 = factor as shown in table 2.3.4-1

X_2 = factor as shown in table 2.3.4-2

k = factor as follows:

k = 1.0 for a round-bilged ship having no bilge or bar keels

k = 0.7 for a ship having sharp bilges

k = as shown in table 2.3.4-3 for a ship having bilge keels, a bar keel or both

$$r = 0.73 + \frac{0.6\ \text{OG}}{d}$$

with:

OG = KG – d

d = mean moulded draught of the ship (m)

s = factor as shown in table 2.3.4-4, where T is the ship roll natural period. In absence of sufficient information, the following approximate formula can be used:

$$\text{Rolling period } T = \frac{2 \cdot C \cdot B}{\sqrt{\text{GM}}} \ (s)$$

where: $C = 0.373 + 0.023(B/d) - 0.043(L_{wl}/100)$.

The symbols in tables 2.3.4-1, 2.3.4-2, 2.3.4-3 and 2.3.4-4 and the formula for the rolling period are defined as follows:

L_{wl} = length of the ship at waterline (m)

B = moulded breadth of the ship (m)

d = mean moulded draught of the ship (m)

C_B = block coefficient

A_k = total overall area of bilge keels, or area of the lateral projection of the bar keel, or sum of these areas (m^2)

GM = metacentric height corrected for free surface effect (m).

Table 2.3.4-1 – *Values of factor X_1*

B/d	$\boldsymbol{X_1}$
≤2.4	1.0
2.5	0.98
2.6	0.96
2.7	0.95
2.8	0.93
2.9	0.91
3.0	0.90
3.1	0.88
3.2	0.86
3.4	0.82
≥3.5	0.80