

ANNEX 8

STABILITY OF MONOHULL CRAFT

This annex was introduced into the 2000 HSC Code to bring consistency of format to the presentation of stability criteria for different craft types.

1 Stability criteria in the intact condition

1.1 The weather criterion contained in paragraph 3.2 of the Intact Stability Code* shall apply. In applying the weather criterion, the value of wind pressure P (N/m²) shall be taken as:

$$500\{V_w/26\}^2$$

where V_w = wind speed (m/s) corresponding to the worst intended conditions.

The angle of heel due to wind, in applying paragraph 3.2.2.1.2 of the Intact Stability Code, shall not exceed 16° or 80% of the angle of deck-edge immersion (whichever is less). Where the angle of heel due to wind exceeds 10°, efficient non-slip deck surfaces and suitable holding points shall be provided, in accordance with paragraph 2.13.1.1 of this Code. In applying the weather criterion, account shall also be taken of the roll damping characteristics of individual craft in assessing the assumed roll angle θ_1 , which may alternatively be derived from model or full scale tests using the method for determining θ_z in 1.1.5.3 of annex 6. Hulls with features which greatly increase damping, such as immersed sidehulls, substantial arrays of foils, or flexible skirts or seals, are likely to experience significantly smaller magnitudes of roll angle. For such craft, therefore, the roll angle shall be derived from model or full scale tests or, in the absence of such data, shall be taken as 15°.

* Refer to the Code on Intact Stability for All Types of Ships Covered by IMO Instruments, adopted by the Organization by resolution A.749(18), as amended by resolution MSC.75(69).

The International Code on Intact Stability 2008 (Ref. MSC 83/28/Add.2) was adopted in May 2008 and takes effect from 1st July 2010.

1.2 The area under the righting lever curve (GZ curve) shall not be less than 0.07 m.rad up to $\theta = 15^\circ$ when the maximum righting lever (GZ) occurs at $\theta = 15^\circ$, and 0.055 m.rad up to $\theta = 30^\circ$ when the maximum righting lever occurs at $\theta = 30^\circ$ or above. Where the maximum righting lever occurs at angles of between $\theta = 15^\circ$ and $\theta = 30^\circ$, the corresponding area under the righting lever curve shall be:

$$A = 0.055 + 0.001 (30^\circ - \theta_{\max}) \text{ (m.rad)}$$

where:

θ_{\max} is the angle of heel, in degrees, at which the righting lever curve reaches its maximum.

1.3 The area under the righting lever curve between $\theta = 30^\circ$ and $\theta = 40^\circ$ or between $\theta = 30^\circ$ and the angle of flooding θ_F^* if this angle is less than 40°, shall not be less than 0.03 m.rad.

* In applying this criterion, small openings through which progressive flooding cannot take place need not be considered open.

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

1.5 The maximum righting lever shall occur at an angle of heel not less than 15°.

1.6 The initial metacentric height GM_T shall not be less than 0.15 m.

2 Criteria for residual stability after damage

2.1 The stability required in the final condition after damage, and after equalization where provided, shall be determined as specified in 2.1.1 to 2.1.4.

2.1.1 The positive residual righting lever curve shall have a minimum range of 15° beyond the angle of equilibrium. This range may be reduced to a minimum of 10°, in the case where the area under the righting lever curve is that specified in 2.1.2, increased by the ratio:

$$\frac{15}{\text{range}}$$

where the range is expressed in degrees.

The range shall be taken as the difference between the equilibrium heel angle and the heel angle at which the residual righting lever subsequently becomes negative or the angle at which progressive flooding occurs, whichever is less.

2.1.2 The area under the righting lever curve shall be at least 0.015 m.rad, measured from the angle of equilibrium to the lesser of:

- .1 the angle at which progressive flooding occurs; and
- .2 27° measured from the upright.

2.1.3 A residual righting lever shall be obtained within the range of positive stability, taking into account the greatest of the following heeling moments:

- .1 the crowding of all passengers towards one side;
- .2 the launching of all fully loaded davit-launched survival craft on one side; and
- .3 due to wind pressure,

as calculated by the formula:

$$GZ = \frac{\text{heeling moment}}{\text{displacement}} + 0.04 \text{ (m)}$$

However, in no case, this righting lever shall be less than 0.1 m.

2.1.4 For the purpose of calculating the heeling moments referred to in 2.1.3, the following assumptions shall be made:

- .1 Moments due to crowding of passengers. This should be calculated in accordance with 2.10 of the Code.
- .2 Moments due to launching of all fully loaded davit-launched survival craft on one side:
 - .2.1 all lifeboats and rescue boats fitted on the side to which the craft has heeled after having sustained damage shall be assumed to be swung out fully loaded and ready for lowering;
 - .2.2 for lifeboats which are arranged to be launched fully loaded from the stowed position, the maximum heeling moment during launching shall be taken;
 - .2.3 a fully loaded davit-launched liferaft attached to each davit on the side to which the craft has heeled after having sustained damage shall be assumed to be swung out ready for lowering;
 - .2.4 persons not in the life-saving appliances which are swung out shall not provide either additional heeling or righting moment; and
 - .2.5 life-saving appliances on the side of the craft opposite to the side to which the craft has heeled shall be assumed to be in a stowed position.
- .3 Moments due to wind pressure:
 - .3.1 the wind pressure shall be taken as $(120 \{V_w/26\}^2)$ (N/m²), where V_w = wind speed (m/s), corresponding to the worst intended condition;
 - .3.2 the area applicable shall be the projected lateral area of the craft above the waterline corresponding to the intact condition; and
 - .3.3 the moment arm shall be the vertical distance from a point at one half of the mean draught corresponding to the intact condition to the centre of gravity of the lateral area.

2.2 In intermediate stages of flooding, the maximum righting lever shall be at least 0.05 m and the range of positive righting levers shall be at least 7°. In all cases, only one breach in the hull and only one free surface need be assumed.