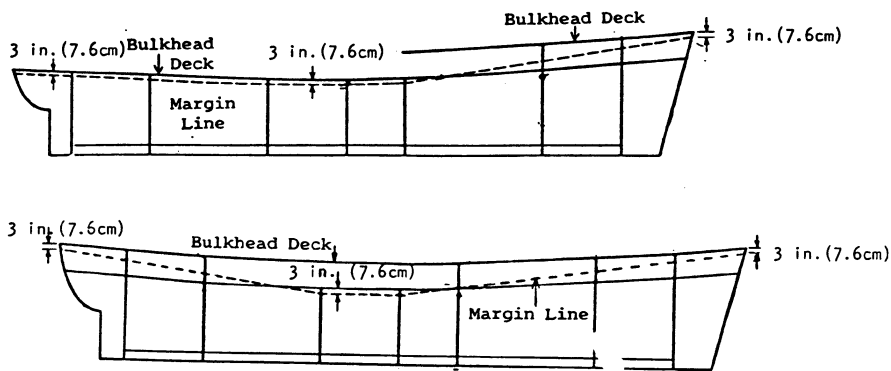


Figure 171.015(d)

Margin Line for a Vessel With a Discontinuous Bulkhead Deck and With Side Shell Watertight to a Higher Deck



§ 171.017 One and two compartment standards of flooding.

(a) *One compartment standard of flooding.* A vessel is designed to a one compartment standard of flooding if the margin line is not submerged when the total buoyancy between each set of two adjacent main transverse watertight bulkheads is lost.

(b) *Two compartment standard of flooding.* A vessel is designed to a two compartment standard of flooding if the margin line is not submerged when the total buoyancy between each set of three adjacent main transverse watertight bulkheads is lost.

Subpart B [Reserved]

Subpart C—Large Vessels

§ 171.045 Specific applicability.

This subpart applies to each vessel that fits into any one of the following categories:

- (a) Greater than 100 gross tons.
- (b) Greater than 65 feet (19.8 meters) in length.
- (c) Carries more than 12 passengers on an international voyage.
- (d) Carries more than 150 passengers.
- (e) The stability of which is questioned by the OCMI.

§ 171.050 Intact stability requirements for a mechanically propelled or a nonself-propelled vessel.

Each vessel must be shown by design calculations to have a metacentric height (GM) in feet (meters) in each condition of loading and operation, that is not less than the value given by the following equation:

$$GM = \frac{Nb}{(K)(W)(\tan(T))}$$

where—

- N=number of passengers.
- W=displacement of the vessel in long (metric) tons.
- T=14 degrees or the angle of heel at which the deck edge is first submerged, whichever is less.
- b=distance in feet (meters) from the centerline of the vessel to the geometric center of the passenger deck on one side of the centerline.
- K=24 passengers/long ton (23.6 passengers/metric ton).

§ 171.055 Intact stability requirements for a monohull sailing vessel or a monohull auxiliary sailing vessel.

(a) Except as specified in paragraph (b) of this section, each monohull sailing vessel and auxiliary sailing vessel must be shown by design calculations to meet the stability requirements in this section.

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(b) Additional or different stability requirements may be needed for a vessel of unusual form, proportion, or rig. The additional requirements, if needed, will be prescribed by the Commandant.

(c) Each vessel must have positive righting arms in each condition of loading and operation from—

(1) 0 to at least 70 degrees of heel for service on protected or partially protected waters; and

(2) 0 to at least 90 degrees of heel for service on exposed waters.

(d) Each vessel must be designed to satisfy the following equations:

(1) For a vessel in service on protected or partially protected waters—

$$\frac{1000(W)HZA}{(A)(H)} \geq X$$

$$\frac{1000(W)HZB}{(A)(H)} \geq Y$$

$$\frac{1000(W)HZC}{(A)(H)} \geq Z$$

where—

X=1.0 long tons/sq. ft. (10.9 metric tons/sq. meter).

Y=1.1 long tons/sq. ft. (12.0 metric tons/sq. meter).

Z=1.25 long tons/sq. ft. (13.7 metric tons/sq. meter).

(2) For a vessel on exposed waters—

$$\frac{1000(W)HZA}{(A)(H)} \geq X$$

$$\frac{1000(W)HZB}{(A)(H)} \geq Y$$

$$\frac{1000(W)HZC}{(A)(H)} \geq Z$$

where—

HZA, HZB, and HZC are calculated in the manner specified in paragraph (e) or (f) of this section.

X=1.5 long tons/sq. ft. (16.4 metric tons/sq. meter).

Y=1.7 long tons/sq. ft. (18.6 metric tons/sq. meter).

Z=1.9 long tons/sq. ft. (20.8 metric tons/sq. meter).

A=the projected lateral area or silhouette in square feet (meters) of the portion of the vessel above the waterline computed with all sail set and trimmed flat. Sail overlap areas need not be included except parachute type spinnakers which are to be added regardless of overlap.

H=the vertical distance in feet (meters) from the center of A to the center of the underwater lateral area or approximately to the one-half draft point.

W=the displacement of the vessel in long (metric) tons.

(e) Except as provided in paragraph (f) of this section, HZA, HZB, and HZC must be determined as follows for each condition of loading and operation:

(1) Plot the righting arm curve on Graphs 171.055 (b), (c), and (d) or (e).

(2) If the angle at which the maximum righting arm occurs is less than 35 degrees, the righting arm curve must be truncated as shown on Graph 171.055(a).

(3) Plot an assumed heeling arm curve on Graph 171.055(b) that satisfies the following conditions:

(i) The assumed heeling arm curve must be defined by the equation—

$$HZ=HZA \cos^2 (T)$$

where—

HZ=heeling arm.

HZA=heeling arm at 0 degrees of heel.

T=angle of heel.

(ii) The first intercept shown on Graph 171.055(b) must occur at the angle of heel corresponding to the angle at which deck edge immersion first occurs.

(4) Plot an assumed heeling arm curve on Graph 171.055(c) that satisfies the following conditions:

(i) The assumed heeling arm curve must be defined by the equation—

$$HZ=HZB \cos^2 (T)$$

where—

HZ=heeling arm.

HZB=heeling arm at 0 degrees of heel.

T=angle of heel.

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(ii) The area under the assumed heeling arm curve between 0 degrees and the downflooding angle or 60 degrees, whichever is less, must be equal to the area under the righting arm curve between the same limiting angles.

(5) Plot an assumed heeling arm curve on Graph 171.055 (d) or (e) that satisfies the following conditions:

(i) The assumed heeling arm curve must be defined by—

$$\leq HZ = HZC \cos^2 (T)$$

where—

HZ=heeling arm.

HZC=heeling arm at 0 degrees of heel.

T=angle of heel.

(ii) The area under the assumed heeling arm curve between the angles of 0 and 90 degrees must be equal to the area under the righting arm curve between 0 degrees and—

(A) 90 degrees if the righting arms are positive to an angle less than or equal to 90 degrees; or

(B) The largest angle corresponding to a positive righting arm but no more than 120 degrees if the righting arms are positive to an angle greater than 90 degrees.

(6) The values of HZA, HZB, and HZC are read directly from Graphs 171.055 (b), (c), and (d) or (e).

(f) For the purpose of this section, the downflooding angle means the static angle from the intersection of the vessel's centerline and waterline in calm water to the first opening that cannot be rapidly closed watertight.

(g) HZB and, if the righting arms are positive to an angle of 90 degrees or greater, HZC may be computed from the following equation:

$$HZB \text{ (or HZC)} = \frac{I}{((T / 2) + 14.3 \sin 2T)}$$

where—

I=the area under the righting arm curve to—

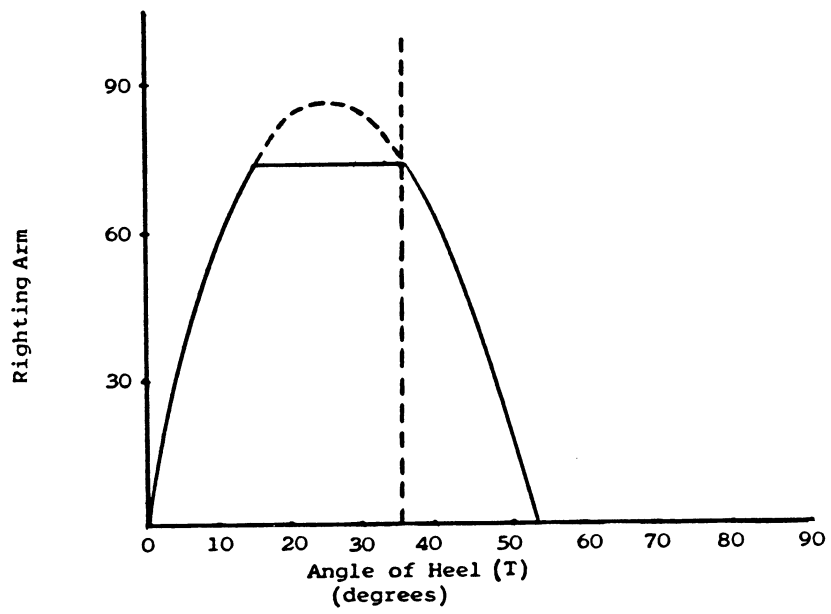
(1) the downflooding angle or 60 degrees, whichever is less, when computing HZB; or

(2) the largest angle corresponding to a positive righting arm or 90 degrees, whichever is greater, but no greater than 120 degrees when computing HZC.

T=the downflooding angle or 60 degrees, whichever is less, when computing HZB or 90 degrees when computing HZC.

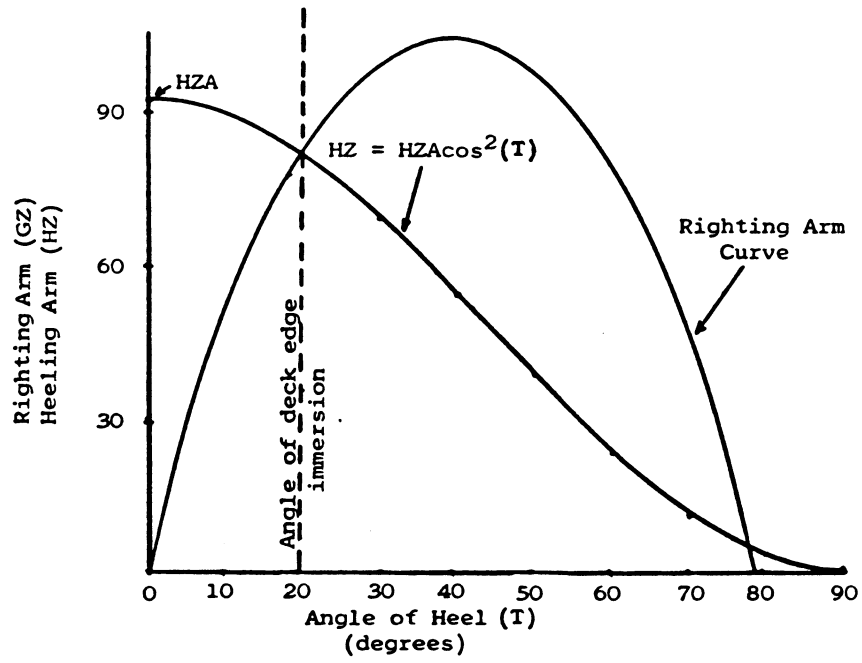
GRAPH 171.055(a)

Truncation of Righting Arm Curve if Maximum Righting Arm Occurs at an Angle of Heel Less Than 35 Degrees



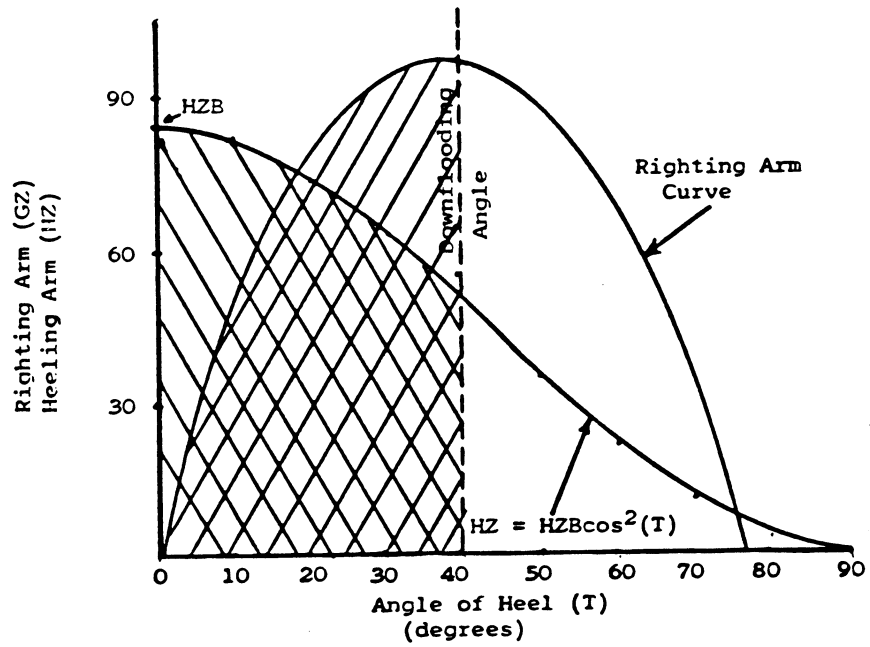
GRAPH 171.055(b)

First Intercept Occurs at the Angle at Which Deck
Edge Immersion First Occurs



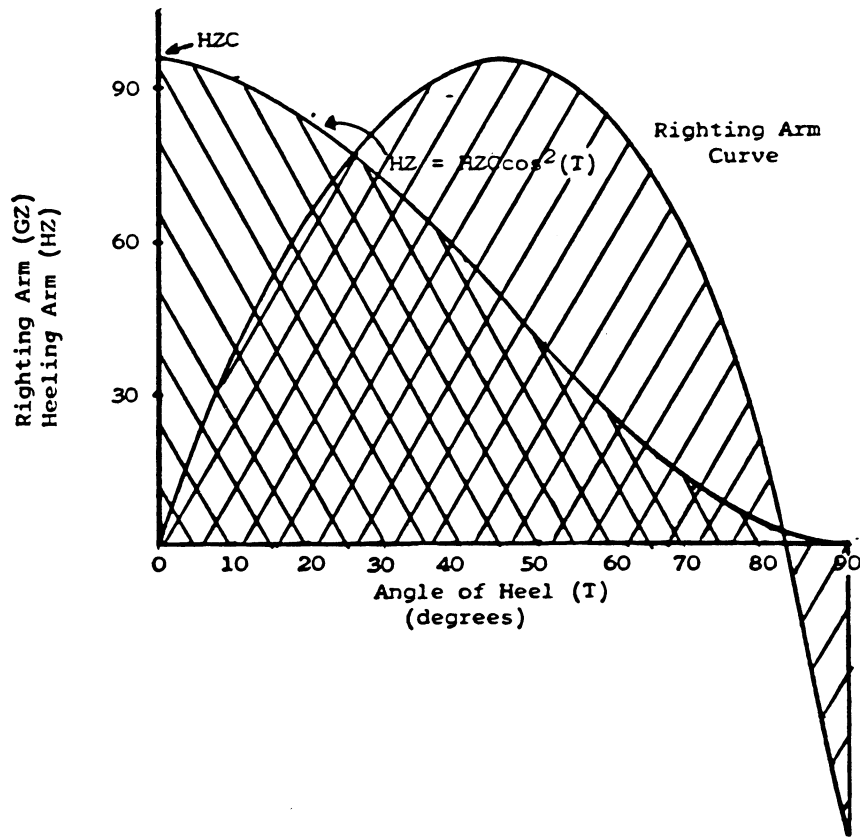
GRAPH 171.055(c)

Shaded Areas are Balanced to the Downflooding Angle



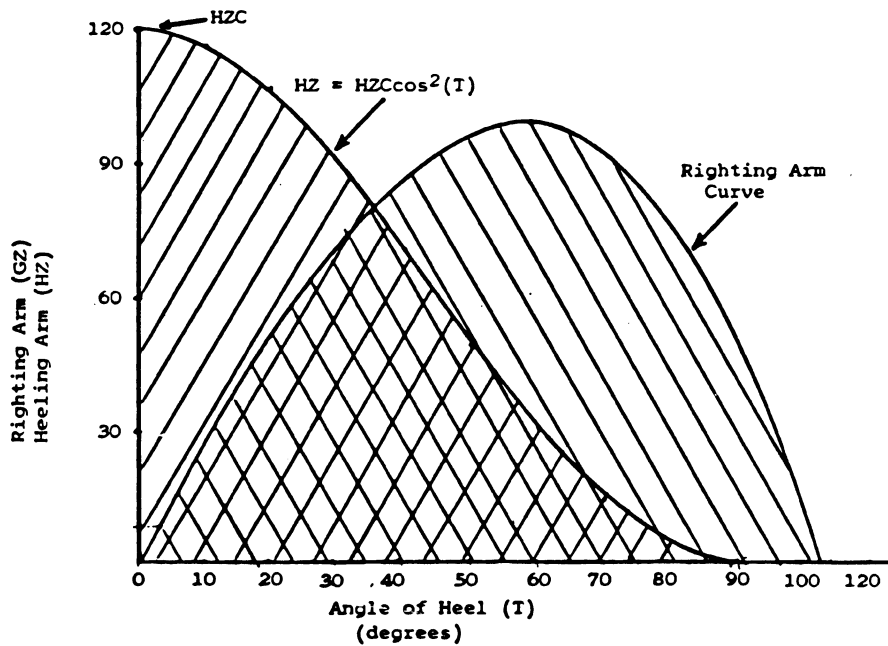
GRAPH 171.055(d)

Righting Arm Curve is not Positive to 90 Degrees and Negative Area is Included



GRAPH 171.055(e)

Righting Arm Curve is Positive Beyond 90 Degrees



[CGD 79-023, 48 FR 51017, Nov. 4, 1983, as amended by CGD 83-005, 51, FR 924, Jan. 9, 1986]

§ 171.057 Intact stability requirements for a sailing catamaran.

(a) A sailing vessel that operates on protected waters must be designed to satisfy the following equation:

$$\frac{0.1(W)B}{(As)(Hc)} \geq X$$

Where—

B=the distance between hull centerlines in meters (feet).

As=the maximum sail area in square meters (square feet).

Hc=the height of the center of effort of the sail area above the deck, in meters (feet).

W=the total displacement of the vessel, in kilograms (pounds).

X=4.88 kilograms/square meter (1.0 pounds/square foot).

(b) A sailing vessel that operates on partially protected or exposed waters must be designed to satisfy the following equation:

$$\frac{0.1(W)B}{(As)(Hc)} \geq X$$

Where—

B=the distance between hull centerlines in meters (feet).