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AMENDMENT 1
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Small craft — Stability and buoyancy assessment and categorization —

Part 3: Boats of hull length less than 6 m

AMENDMENT 1

Petits navires — Évaluation de la stabilité et de la flottabilité et catégorisation —

Partie 3: Bateaux d'une longueur de coque inférieure à 6 m

AMENDEMENT 1

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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Amendment 1 to ISO 12217-3:2002 was prepared by Technical Committee ISO/TC 188, *Small craft*.

Small craft — Stability and buoyancy assessment and categorization —

Part 3:
Boats of hull length less than 6 m

AMENDMENT 1

Page 12, 6.3

Replace the content of 6.3 with the following:

6.3 Offset-load tests

6.3.1 General

6.3.1.1 This test is to demonstrate sufficient stability against offset loading by the crew, for unswamped boats. If it is more convenient, people may be used instead of test weights provided that the mass of each person used equals or exceeds that of the relevant test weight. Calculation of stability using a mass for the boat established by measurement may be used instead of a practical test. Testing shall be conducted in conditions of smooth water and light winds.

6.3.1.2 Each boat shall be tested according to the offset-load test using either the simplified method in 6.3.2 or the full method in 6.3.3. The full method may be applied using either the physical test or the calculation method. The simplified method may only be applied by calculation. If the mass in the light craft condition is less than 800 kg, the boat shall also be tested according to the gunwale load test in 6.3.4.

NOTE The simplified method incorporates greater safety margins and is most suitable for boats with generous static stability in relation to the crew limit, e.g. those with a crew limit of less than one per metre length.

6.3.1.3 All boats shall be tested at loaded displacement mass, m_{LDC}, except that boats having any tank (fuel, fresh and black water, live wells, oils, etc.) that has a maximum transverse dimension greater than 0,35 B_H shall be tested with all tanks as close as practicable to 50 % full, but never less than 25 % or more than 75 % full. Where applicable, free-surface effect shall be represented either by a virtual increase in the VCG or by using computer software that models the movement of fluid in tanks.

6.3.1.4 In general, boats shall be tested when heeled to both port and starboard. However, where it is clearly evident that one direction of heel is the more critical, only heel angles in this direction need be tested.

EXAMPLE Initial list and/or lower downflooding openings on one side and/or crew area are clearly asymmetrical.

6.3.1.5 During the tests, on boats with watertight or quick-draining cockpits, water may enter the cockpit through drains when the boat is heeled during the test, provided that this water drains overboard when the centre of gravity of all test weights on board are moved to the centreline. Where water enters the boat during the test, the heel angle and downflooding height measurements shall be recorded after the inflow of water has stopped.

6.3.1.6 During the tests, the freeboard margin (vertical height from the waterline) shall be measured to the point at which water could first begin to enter the interior or bilge. When measuring the freeboard margin, downflooding openings through the topsides should also be considered. When making such measurements, one outboard engine well penetration fitted with a sealing boot may be regarded as watertight.

6.3.1.7 The "crew area" comprises the "working deck" as defined by the manufacturer in accordance with ISO 15085 plus the areas of all seats, bunks, sunbathing pads and internal decks. It shall always include all of the primary cockpit, and all areas designated to be used by the crew when the boat is stationary, but may exclude ledges less than 0,05 m in width.

NOTE See ISO 15085:2003, 3.6, Note 3 for treatment of sloping surfaces.

If the manufacturer chooses to assess the stability by excluding some areas from the "crew area" or limiting the number of people on any given level,

— such areas shall be listed in the owner's manual, and

— such areas shall be physically marked at all clearly defined points of access with "no access" or "limited access" signs as illustrated in Figures 4 and Amd.1-1, or

— a diagram shall be placed at each helm position identifying such areas and their access limitations (see Figure Amd.1-2), and in addition "no access" or "limited access" signs as illustrated in Figures 4 and Amd.1-1 shall be placed at those points of access not visible from all alternative helm positions.

In dinghies and open boats, the crew area comprises all the interior of the boat. In dayboats it may be restricted to the cockpit provided that doing so still permits anchoring or mooring to be undertaken.

In Figure Amd.1-1 the number and the location should be adjusted as appropriate to the required restriction, e.g. coachroof, foredeck, flybridge.

Figure 4 — No access
(using ISO 7010 – P004 "No thoroughfare")

Figure Amd.1-1 — Limited access
(using ISO 7010 – W001 "General warning")

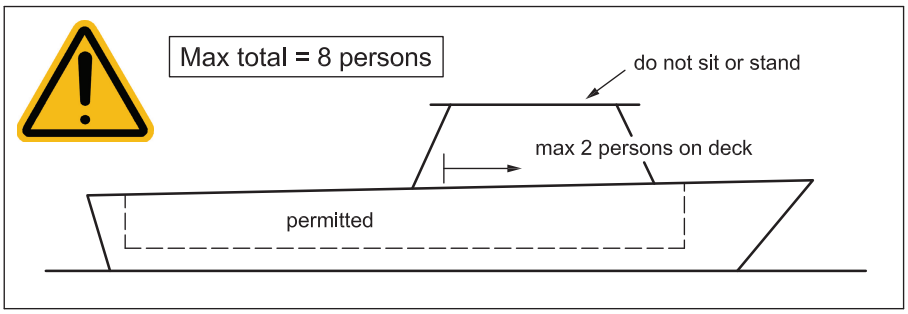


Figure Amd.1-2 — Example of crew area and access limitation label for control position
(using ISO 7010 – W001 "General warning")

6.3.1.8 When such labels are fitted, they shall be placed where they are clearly visible, and shall be made of rigid plate or flexible labels affixed to the craft in such a way that they can only be removed by the use of tools. The size of the symbols and text in Figures 4, Amd.1-1 and Amd.1-2 shall comply with Table Amd.1-1. Text shall be in black on a white background, using a plain sans serif typeface such as Arial Narrow. The language used shall be acceptable or as required in the country of intended use.

Table Amd.1-1 — Size of safety signs and supplementary text

Expected viewing distance (m)	⩽ 0,6	> 0,6 ⩽ 1,2	> 1,2 ⩽ 1,8	> 1,8 ⩽ 2,4	> 2,4
Minimum height of sign in figures (mm)	20,0	20,0	30,0	40,0	50,0
Minimum height of capital letters (mm)	2,4	4,8	7,2	9,6	12,0
Minimum height of lower case letters (mm) [a]	1,7	3,4	5,1	6,9	8,6
[a] For example, height of the letter "e".					

6.3.2 Simplified procedure for offset-load test

6.3.2.1 This method may only be applied by calculation.

6.3.2.2 Calculate the mass and centre of gravity of the boat for two conditions (LC1 and LC2) as follows:

— boat in loaded displacement condition except for the tanks, which are to be treated as described in 6.3.1.3; and

— VCG of the crew used shall represent the maximum number permitted (at 85 kg each) on the highest part of the crew area (as defined in 6.3.1.7), e.g. flybridge or coachroof top, located with their VCG 0,1 m above the seats, and the maximum number of crew permitted (at 85 kg each) on each successively lower part of the crew area (e.g. wheelhouse, main deck or cockpit), located with their VCG 0,1 m above the seats, until the total number of persons equals the intended crew limit. Where there are no seats, the VCG of crew shall be located 0,1 m above the surface on which they stand;

— (LC1) LCG of the crew at 75 % of the crew area length (as defined in 6.3.1.7) forward of its aft limit, and CG on the centreline;

— (LC2) LCG of the crew at 25 % of the crew area length (as defined in 6.3.1.7) forward of its aft limit, and CG on the centreline.

6.3.2.3 Calculate the curve of righting moments according to Annex D in ISO 12217-1:2002.

6.3.2.4 Apply a heeling moment equal to 961 CL $(B_C/2 - 0{,}2)$ cos ϕ (N·m), where B_C is the maximum transverse distance between the outboard extremities of any parts of the crew area as defined in 6.3.1.7, and ϕ is the heel angle. Where the crew area includes side decks less than 0,4 m wide, the moment used shall be 480 CL B_C cos ϕ (N·m). Ledges less than 0,05 m wide may be excluded from the crew area.

6.3.2.5 The boat satisfies the test if:

— the minimum heeled freeboard margin before downflooding is not less than required in Table 4, whether obvious to the crew (e.g. over the gunwale) or not obvious (e.g. through openings in the topsides); and

— the heel angle (degrees) does not exceed $11{,}5 + \frac{(24 - L_H)^3}{520}$ (see also Table 5);

— the maximum righting moment occurring up to the downflooding angle is greater than the heeling moment at the resulting heel angle.

Table 4 — Required minimum heeled freeboard margin during offset-load test

Dimensions in millimetres

Option	1	2	3	4	5	6
Design category C	100	100	Not applicable	150	Not applicable	100
Design category D	10	10	Not applicable	10	170	10

Table 5 — Maximum permitted heel angle for offset-load test

L_H (m)	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0
$\phi_{O(R)}$(°)	30,6	29,3	28,1	26,9	25,8	24,7	23,7	22,7

6.3.3 Full procedure for offset-load test

6.3.3.1 This method may be applied by either physical test or by calculation. Calculation should replicate the physical test method described below.

6.3.3.2 Prepare a set of test weights totalling 85 kg for each person up to the desired crew limit. Then test the boat according to 6.3.3.3. A boat of category D may alternatively be tested using 6.3.3.4.

NOTE 1 The use of water containers instead of metallic test weights will give a less advantageous result. The use of persons might give a less advantageous result but be more convenient to test.

NOTE 2 85 kg includes a margin of 13 % to allow for the probability that a group of persons can weigh on average more than 75 kg each.

6.3.3.3 The following procedure shall be followed.

a) With the boat at loaded displacement mass except that the tanks are to be filled as in 6.3.1.3, place the first set of test weights to one side of the crew area but not less than 200 mm from the outboard edge of the crew area, in the position that results in the maximum heel angle, investigating positioning test weights on various deck levels within the crew area and at various longitudinal locations to ensure that the worst case is found. Measure the heel angle and freeboard margin. Where the crew area includes side decks less than 0,4 m wide, test weights shall be placed at mid-width of such decks.

b) If necessary, repeat in the opposite direction of heel. Where both directions are tested, the most adverse of the two measurements made of each parameter shall be recorded.

c) Place the next set of test weights to one side of the crew area, in the position that results in the maximum heel angle, investigating positioning test weights on various deck levels within the crew area and at various longitudinal locations to ensure that the worst case is found. The centre of gravity of the sets of test weights shall be positioned as far to one side as practicable, provided that adjacent sets of test weights are not placed with their centres of gravity less than 500 mm apart in any direction, or less than 200 mm from the outboard edge of crew area. Where the crew area includes side decks less than 0,4 m wide, test weights shall be placed at mid-width of such decks.

d) Measure the heel angle and least freeboard margin. If necessary, repeat in the opposite direction of heel. Where both directions are tested, the most adverse of the two measurements made shall be recorded.

e) Repeat c) and d) for further increments of not more than one set of test weights at a time, whilst observing the manufacturer's definition of crew area according to 6.3.1.7. Stop the test when the first of the following events happens:

1) the minimum freeboard margin before downflooding is reached according to Table 4, whether obvious to the crew (e.g. over the gunwale) or not obvious to the crew (e.g. through downflooding openings in the topsides);

2) the heel angle (degrees) is about to exceed $11{,}5 + \frac{(24 - L_H)^3}{520}$ (see also Table 5);

3) the total mass of test weights on board reaches 98 kg per person for the desired crew limit;

NOTE 98 kg per person is used here to ensure that a safety margin is achieved against sudden loss of stability.

4) the heel angle suddenly increases a large amount for a small increase in heeling moment. This is when the boat is close to a complete loss of residual stability and consequent capsize.

CAUTION — Take great care when doing this test because some boats can capsize suddenly. Increase heeling moments carefully, especially when approaching the expected crew limit. As this point is approached, use smaller increments of test weights. In smaller boats it is helpful to attach a capsize-preventer rope (e.g. from the depressed gunwale to a strong point ashore) provided that this is kept slack enough not to interfere with the test. For larger boats, to give warning of loss of stability, use a continuously plotted graph of heel angle against heeling moment (mass of test weights multiplied by the distance off the centreline measured parallel to the design waterline).

CAUTION — Because of the risk of capsize, persons should not be used instead of sets of test weights in any locations from which escape would become hazardous.

f) Of the measurements made according to a), b), d) or e), the maximum heel angle recorded shall be less than that required in e) above, and the minimum measured freeboard margin recorded shall exceed the requirement for the appropriate option as given in Table 4.

g) If the test is limited by downflooding that is obvious to the crew (e.g. over the gunwale), the crew limit corresponds to the maximum mass of test weights divided by 85 kg and rounded downward to the nearest whole number.

h) If the test is limited by maximum heel angle, loss of stability or downflooding that is not obvious to the crew (e.g. through openings in the topsides), the crew limit corresponds to the maximum mass of test weights divided by 98 kg and rounded downward to the nearest whole number.

NOTE 98 kg per person is used here to ensure that a safety margin is achieved against sudden loss of stability.

i) After completion of testing according to a) to h), the sets of test weights are to be moved to the positions [using the criteria of c) above] that result in the least freeboard margin. If the measured freeboard does not satisfy Table 4, sets of test weights shall be removed until this is achieved, whilst maintaining the most adverse positioning of the remainder.

j) The final crew limit shall be that which complies with both the procedure described in a) to h), and that given in i) above.

When recording the heel angle of the boat, people engaged in measuring the heel angle shall return to the same position on board each time that measurements are recorded. Heeled freeboard margin shall be measured by a person not on board the boat being tested.

6.3.3.4 Where a boat is unable to comply with the above test procedures, or where a safety sign label is acceptable, it may alternatively be tested using the same procedure but with sets of test weights totalling $85 \times L_H/6$ kg for each person up to the crew limit, provided that it is assigned design category D and a safety sign as shown in Figure Amd.1-3 is displayed. When this sign is fitted, it shall comply with 6.3.1.8.

Figure Amd.1-3 — Boat is vulnerable to capsize or swamping
(using ISO 7010 – W001 "General warning")

6.3.4 Procedure for gunwale load test

6.3.4.1 Apply a vertically downwards load of 85 kg to the boat in the light craft condition at maximum beam, at the fore-and-aft location which is both a practical access point and which causes the greatest heel angle. If this load is applied by suspending a test weight in the water, the dry mass of the test weight shall be $85d$, where d is a material coefficient as given in Table Amd.1-2.

NOTE 85 kg includes a margin of 13 % to allow for the probability that a person can weigh on average more than 75 kg.

Table Amd.1-2 — Material coefficient

Material	Lead	65/35 brass	Steel	Cast iron	Aluminium
Value of d	1,099	1,138	1,151	1,163	1,612

6.3.4.2 If the boat swamps or capsizes under this load, it shall be restricted to design category D, and a warning label as shown in Figure Amd.1-4 shall be displayed where it is clearly visible when entering the boat. This label shall have a minimum vertical dimension of 25 mm and shall be a rigid plate or flexible label affixed to the craft in such a way that it can only be removed by the use of tools.

Figure Amd.1-4 — Do not sit on the gunwale
(using ISO 7010 – W001 “General warning”)

Page 14, 6.5

In the first paragraph, replace “B.4.2” with “B.4.3”.

Page 31, E.2

Add the following as list item b):

b) **IMPORTANT: Failure to observe these limitations can result in the boat capsizing.**
(Where certain parts of the boat have had crew access restricted by the offset-load test, the following text shall be included, as appropriate.)

For stability reasons, the following parts of the boat should only be accessed by people in exceptional circumstances: *(insert list of relevant locations)*. Such locations are indicated by the following safety sign:

(using ISO 7010 — P004 “No thoroughfare”)

For stability reasons, the following parts of the boat should only be accessed by more than the indicated number of persons in exceptional circumstances: (insert list of relevant locations, e.g. deck, coachroof, flybridge and limit on each location). Such locations are indicated by the following safety sign and/or a sign at each control position:

(using ISO 7010 — W001 “General warning”)

Page 31, E.2

Add the following after list item f):

g) This boat has limited stability and is therefore at greater risk of capsize or swamping. Users should take special care to keep the boat upright by adjusting their position in the boat. The following safety sign warns of this hazard. *(Boats using 6.3.3.4)*

(using ISO 7010 — W001 “General warning”)

h) This boat will capsize or swamp if a load of 85 kg is placed on the gunwale. Users should not sit or stand on the gunwale. The following safety sign warns of this hazard. *(Boats failing the test in 6.3.4)*

(using ISO 7010 — W001 “General warning”)

Page 32, Table F.1

Replace Table F.1 with the following:

Table F.1 — Summary of requirements for non-sailing boats

Configuration or requirement	Option number		1		2		3	4		5	6	
	Design category		C	D	C	D	D	C	D	D	C	D
	Lengths applicable		Up to 6,0 m					From 4,8 m up to 6,0 m				
Degree of decking or covering	Any amount		yes	yes			yes			yes	yes	yes
	Partially decked							yes	yes			
	Fully decked				yes	yes						
Required downflooding height (using Figure 2)	Shall not be less than		—	0,20	0,30	0,20	0,20	0,40	0,343	—	0,32	0,282
	Shall not be less than		0,30	$L_H/24$	$L_H/17$	$L_H/20$	$L_H/24$	$L_H/12$	$L_H/14$	0,40	$L_H/15$	$L_H/17$
	Need not be more than		—	0,25	0,353	0,30	0,25	0,50	0,40	—	0,40	0,353
Downflooding height (by Annex A)	Shall not be less than		0,30	0,20	0,30	0,20	0,20	0,30	0,20	0,40	0,30	0,20
	Need not be more than		0,75	0,40	0,75	0,40	0,40	0,75	0,40	—	0,75	0,40
Offset-load test (6.3)	Mass (kg) used per person	without Fig. Amd.1-3 safety sign	85	85	85	85	—	85	85	85	85	85
		with Fig. Amd.1-3 safety sign	—	$14{,}17 \times L_H$	—	$14{,}17 \times L_H$	—	—	—	—	—	—
	Freeboard left (m) >		0,10	0,01	0,10	0,01	—	0,15	0,01	0,17	0,10	0,01
	Heel angle limit (Table 5)		$11{,}5 + (24 - L_H)^3/520$									
	Gunwale load test		required if $m_{LCC} < 800$ kg									
Flotation test required	Level (6.4)		yes	yes								
	Basic (6.5)										yes	yes
	None				yes	yes	yes	yes	yes	yes		
Capsize-recovery test (6.6)	Conduct test		—	—	—	—	yes	—	—	—	—	—
	Warning labels		—	—	—	—	yes	—	—	—	—	—

Page 39, Annex G

In the twelfth row of Calculation Worksheet No. 5, replace “self-draining” with “quick-draining”.

Pages 40 and 46, Annex G

Replace Calculation Worksheets No. 6 and No. 12 with the following:

ISO 12217-3 CALCULATION WORKSHEET - No. 6a **OFFSET-LOAD TEST**

Mass of people used for test **Design:** .....

Name	Ident	Mass (kg)
	A	
	B	
	C	
	D	
	E	
	F	

Name	Ident	Mass (kg)
	G	
	H	
	I	
	J	
	K	
	L	

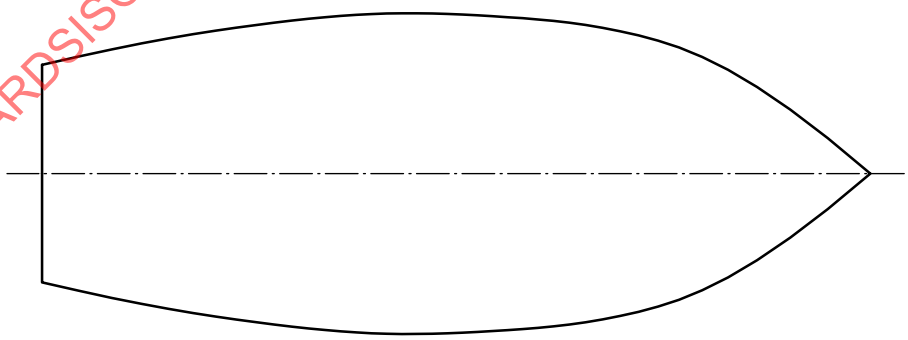
Crew area

Areas included and access limitations (if any):

Area	P/S?[1)]	Incl?	Persons limit
main cockpit		✓	
aft cockpit			
forward cockpit			
saloon			
cabins			
side decks			
fore deck			

Area	P/S?[1)]	Incl?	Persons limit
cuddy top			
coachroof top			
wheelhouse top			
fly bridge			
swim platform			

Sketch: Indicate possible seating locations along the length of the side to be tested using numbers, so that these may later be used to record the positions that people actually occupy. Locations shall not be closer than 0,5 m between centres, and not less than 0,2 m from outboard edge unless on side-decks less than 0,4 m wide.



1) Note whether it is asymmetric by adding P (port) or S (starboard) to denote the larger side.