

Technical information sheet

Supplementary information for stability testing of powered recreational boats

Issued June 2017

Introduction

This technical information sheet provides owners of powered recreational boats with approved methods for determining the safe maximum person's capacity of powered recreational boats.

The stability tests outlined below for boats up to 15m are based on section 5 of Australian Standard 1799.1-2009 Small craft – Part 1: *General requirements for power boats*.

Boat owners are responsible for the conduct of any of the stability tests outlined below. Should a boat owner require assistance in carrying out a stability test, assistance should be sought from a competent person, such as a naval architect, an Australian Maritime Safety Authority (AMSA) accredited surveyor, or a boat builder.

Monohull boats up to 3.75m

A boat shall not ship water when loaded in the following way in smooth water:

- (1) A mass equivalent to the mass of the largest engine for which the boat is rated, including fuel tanks located in the normal position.
- (2) All onboard equipment supplied with the boat is aboard.
- (3) An allowance of 10 kilograms (kg) per person for ancillary equipment and gear is located in the normal stowage areas.
- (4) A mass equivalent to 50% of the maximum persons capacity (kg) calculated at 80kg per person is located on the centreline of the boat (see table).
- (5) A mass equivalent to 50% of the maximum persons capacity (kg) is distributed as far to one side as possible in the space for, and in the normal position of, persons (see table).

NOTE: 'Shipping water' is taken to mean the entry of water into the hull of the boat over gunwales, coamings, or decks, or through transom cut-outs not provided with motor wells, and, in the case of fully enclosed boats, into the normal passenger-carrying space, including self-draining cockpits.

Monohull boats from 3.75m to 6m

A boat shall retain at least 25% of its fully loaded level freeboard measured at the lowest position when loaded in the following way in smooth water:

- (1) A mass equivalent to the mass of the largest engine for which the boat is rated, including fuel tanks and fuel located in the normal position.
- (2) All onboard equipment supplied with boat is aboard.

- (3) An allowance of 10kg per person for ancillary equipment and gear is located in the normal stowage areas.
- (4) A mass equivalent to 50% of the maximum persons capacity (kg) calculated at 80kg per person is located on the centreline for the boat (see table).
- (5) A mass equivalent to 50% of the maximum persons capacity (kg) calculated at 80kg per person is located as far to one side as possible in the space for, and in the normal position of, persons (see table).

Table of loading arrangements

Number of persons	Persons on centreline	Persons outside
1	-	1
2	1	1
3	1.5 ⁽¹⁾	1.5 ⁽¹⁾
4	2	2
5	2	3
6	3	3
7	3	4

NOTES:

- (1) For three persons, one person is on the centre-line, one moves to the side and one is located half-way between the two.
- (2) The 'normal position' means that if weights are used instead of people, each 80kg weight is placed on a seat or thwart at the side of the boat with the centre of gravity in the athwartships direction located to represent the centre of gravity of a person sitting at that position.
- (3) As far as practicable, the trim intended by the manufacturer with the specified number of persons on board is to be maintained.

Monohull boats over 6m

Inclining test

A boat shall be subjected to the greater of the two heeling moments (passenger or wind) set out below under the following conditions:

- (1) The mass of the occupants and gear calculated at 90kg per person (80kg body mass plus 10kg gear allowance) shall be simulated by equivalent masses distributed so as to provide normal trim and the most unfavourable vertical centre of gravity (VCG) likely to occur in service.
- (2) On boats having non-return closures in cockpit scuppers or on weather deck drains, such closures shall be restrained in the open position during the course of the test.

Heeling moment

The heeling moment to be applied to boats when performing the inclining test shall be the greater of:

- (a) $H_p = 1.633(WB)$

Where:

H_p = passenger heeling moment, in newton metres

W = total mass of occupants, in kg

B_p = maximum breadth of space in the boat that is accessible to occupants, in metres.

(b) $H_w = PAh$

Where:

H_w = wind heeling moment, in newton metres

P = 300 for smooth and partially smooth (protected) waters, and 375 for open waters

A = lateral area of the boat above the waterline, including all bridges, flying bridges and masts, in square metres

h = vertical distance from the centre of lateral area of the boat above the waterline to the centre of lateral area of the boat below the waterline, in metres.

NOTE: To convert newton metres to kilogram metres, divide by 9.8.

If biminis or canopies are fitted the total projected area at various angles of heel up to 14° shall be taken into consideration and the largest value of H_w over that range of angles shall be used.

Requirements

Angle of heel

When subjected to the above inclining test (described in section 5.1 of the small craft standard), a power boat shall not heel more than 14°.

Loss of freeboard

When subjected to the inclining test, the loss of freeboard due to heel measured at the point of least freeboard (or at a point three quarters of the length of the boat from the bow if the point of least freeboard is aft of that point) shall not exceed the following:

- (c) On flush deck boats, the freeboard shall be measured to the top of the weather deck at the side. The loss of freeboard shall not be more than half of this freeboard.
- (d) On well deck boats, the freeboard shall be measured to the top of the weather deck at the side. The loss of freeboard shall not be more than half of this freeboard. In boats with scuppers rather than freeing ports, immersion to the hull freeboard may be permitted provided that it does not exceed one-quarter of the height from the load waterline to the top of the gunwale.
- (e) On cockpit boats the freeboard shall be measured to the top of the gunwale. The maximum reduction in freeboard shall be calculated by:

$$\text{Loss of freeboard} = \frac{f(2L - l)}{4L}$$

Where:

f = freeboard when upright, in metres

L = length of boat, in metres

l = length of cockpit, in metres

- (f) On open boats the freeboard shall be measured to the top of the gunwale and the maximum allowable reduction of freeboard shall be one-quarter of this freeboard.

Multihull boats up to 15m

Inclining test

A boat shall be subjected to an inclining test as follows:

- (1) The boat shall be loaded to its maximum persons capacity, calculated at 90kg per person (i.e. 80kg per person plus 10kg allowance for gear).
- (2) With the maximum persons capacity load evenly distributed in the boat, the freeboard is to be measured at the lowest point of the deck.
- (3) With 80kg per person of the maximum persons capacity load placed at the worst situation with regard to heel and trim, the resultant minimum freeboard is to be measured.

Requirements

Freeboard

The freeboard measured in item 3 above shall not be less than one-quarter of that measured in item 2 and in no case less than 75 millimetres (mm).

Reserve volume

The minimum freeboard measured from the loaded boat's waterline to the lowest point of the deck of each hull shall be such that there is a reserve of hull volume of at least 50% of the total volume of the hulls up to the lowest point on the deck. This may be reduced to 25% for pontoon craft designed to be used solely on inland waterways. (A suitable method for determining the reserve hull volume is set out in Australian Standard 1799.1.)

Boats over 15m

Australian Standard 1799.1-2009 only covers boats up to 15m in length. Owners of recreational boats over 15m may still use the capacity assessment formula included in the standard, recognising that the capacity rating achieved using this formula will become increasingly conservative as the length of a boat increases beyond 15m. If a boat owner wants to use a less conservative, that is, a potentially higher-rated, capacity on their label, one of the following methods may be used.

- (1) An evaluation based on the stability criteria used for commercial boats. These criteria are very comprehensive, covering a wide range of boat types and sizes. Details can be found in Section C6 – *Stability* of the National Standard for Commercial Vessels; see the AMSA website at www.amsa.gov.au.
- (2) Certain classification societies also publish stability rules that are acceptable for determining a boat's safe person capacity. Some of the better known maritime classification societies include:
 - American Bureau of Shipping
 - Bureau Veritas
 - Det Norske Veritas
 - Lloyds Register of Shipping.

Owners of larger boats wanting to obtain a less conservative capacity rating for their boat are encouraged to get help from a naval architect or an AMSA accredited surveyor.