AS 1799.1—2009
(Incorporating Amendment Nos 1 and 2)

Australian Standard®

Small craft

Part 1: General requirements for power boats

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- Australian Marine Industries Federation
- Australian Maritime Safety Authority
- Department of Transport, Energy and Infrastructure, SA
- Marine Safety Victoria
- Maritime Safety Queensland
- National Marine Safety Committee
- Institute of Marine Engineering Science and Technology
- NSW Maritime
- Plastics and Chemicals Industry Association
- Royal Institute of Naval Architects
- Royal Volunteer Coastal Patrol
- Yachting Australia

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AS 1799.1—2009
(Incorporating Amendment Nos 1 and 2)

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Small craft

Part 1: General requirements for power boats

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PREFACE

This Standard was prepared by the Standards Australia Committee CS-001, Small Craft, to supersede AS 1799.1—1992, *Small Pleasure Boats Code*, Part 1: *General requirements for power boats.*

This Standard incorporates Amendment No. 1 (May 2010) and Amendment No. 2 (September 2010). The changes required by the Amendments are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

In developing this edition, the Committee took cognisance of the publication, National Assessment of Boating Fatalities in Australia, 1999–2004 published by the National Marine Safety Committee in May 2008.

Apart from a general update and editorial review, this edition incorporates a number of changes in requirements compared to the 1992 edition, the most significant of which are as follows:

(a) The requirements for swamped buoyancy have been revised to make the criteria for acceptance clearer and the means of assessment more objective. This includes an in-water test to determine level flotation.

(b) The arbitrary limit on tiller-steered outboard motors has been replaced by a test of manoeuvrability, based upon the approach used in the USA and Europe.

(c) The assumed masses of outboard motors in Table 2.1 have been revised to align with the latest American Boat and Yacht Council (ABYC) data.

(d) The minimum length at which the stability of a boat is assessed using a heeling test has been reduced from 7.5 m to 6 m.

(e) A requirement to provide an operator's manual has been added.

While it was recognised that elements of AS 1799.1 are sometimes referenced in standards for commercial vessels, the Committee felt that this Standard could only adequately address the minimum safety requirements that apply when a boat is used recreationally, taking into account factors like typical patterns of usage and the anticipated competency of those on board a recreational boat. In circumstances where it is felt that a boat designed for recreational use would be adequate to serve a specific commercial purpose, certain requirements of AS 1799.1 may be appropriate.

Compliance with the following International Standards is deemed to satisfy the requirements of Sections 2 to 6 of this Standard, ISO 8666, ISO 9094-1, ISO 11592, ISO 11812, ISO 12216, ISO 12217-1, ISO 12217-3, ISO 13590, ISO 14946, ISO 15084, ISO 21487. Satisfying the requirements of AS 1799.1 (this Standard) is based on compliance in full with all of the equivalent ISO standards, but not a combination of ISO standards and the requirements in this Standard. See Clause 1.5 for the appropriate ISO Design Category.

At the time of publication of this Standard, the future of the other Parts in the AS 1799 series had yet to be determined.

The terms 'normative' and 'informative' are used to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard
Small craft

Part 1: General requirements for power boats

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out requirements for maximum load, persons and power capacities, and for reserve buoyancy, stability, fire protection, testing of power boats and other safety aspects for craft up to 15 m in overall length used as recreational boats. It does not apply to boats used for commercial purposes or exclusively for racing, nor to canoes, kayaks, inflatable boats, rigid inflatable boats, yachts or auxiliary yachts.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS
1799 Small Pleasure Boats Code
1799.3 Part 3: Engineering
2444 Portable fire extinguishers and fire blankets—Selection and location
4214 Gaseous fire extinguishing systems
4393 Small craft—Hull identification—Coding system
4594 Internal combustion engines—Performance
4594.1 Part 1: Standard reference conditions, declarations of power, fuel and lubricating oil consumption and test methods
4594.3 Part 3: Engines for land, rail-traction and marine use—Test measurements
5601 Gas installations

AS/NZS
1841 Portable fire extinguishers
1841.1 Part 1: General requirements
1841.2 Part 2: Specific requirements for water type extinguishers
1841.3 Part 3: Specific requirements for wet chemical type extinguishers
1841.4 Part 4: Specific requirements for foam type extinguishers
1841.5 Part 5: Specific requirements for powder type extinguishers
1841.6 Part 6: Specific requirements for carbon dioxide type extinguishers
1841.7 Part 7: Portable fire extinguishers—Specific requirements for vaporising liquid type extinguishers
1850 Portable fire extinguishers—Classification, rating and performance testing
2080 Safety glazing for land vehicles
2906 Fuel containers—Portable—plastic and metal
60079 Explosive atmospheres
60079.29.1 Part 29.1: Gas detectors—Performance requirements of detectors for flammable gases

ISO
8665 Small craft—Marine propulsion reciprocating internal combustion engines—Power measurements and declarations

8666 Small craft—Principal data

9094 Small craft—Fire protection
9094-1 Part 1: Craft with a hull length of up to and including 15 m

Australian Transport Council
National Standard for the Australian Builders Plate for Recreational Boats

1.3 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

1.3.1 Aft reference area

That portion of the gunwale or deck the greater value of either 600 mm or 0.1 *L* forward of the moulded line of the stern or transom, measured at the gunwale or deck as appropriate.

NOTE: *L* is the length of the boat, in metres

1.3.2 Ancillary equipment

Portable or secured items of the boat's outfitting at a given point in time, such as ground tackle and safety equipment.

1.3.3 Auxiliary yacht

A yacht fitted with any form of mechanical propulsion.

1.3.4 Basic flotation

A flotation system that will keep a boat carrying its maximum load from sinking when swamped, assuming the occupants of the boat have left it and are in the water clinging to it.

NOTE: With basic flotation the swamped boat may float at any attitude.

1.3.5 Beam (*B*)

The distance between the outer sides of the hull measured horizontally at the widest point.

1.3.6 Buoyancy

The force that causes a boat to float, expressed in newtons.

1.3.7 Cabin sole

The internal cabin deck.

1.3.8 Camber

The athwartships curve of a boat's deck.

1.3.9 Cockpit

An exposed recess in the weather deck.

1.3.10 Cockpit deck

The weather deck in a cockpit.

1.3.11 Cockpit boat

A boat having an exposed recess—

(a) not within the forward 10% of the length of the boat from the stem; and

(b) extending not more than 50% of the length of the boat (see Figure 1.1).

1.3.12 Deck

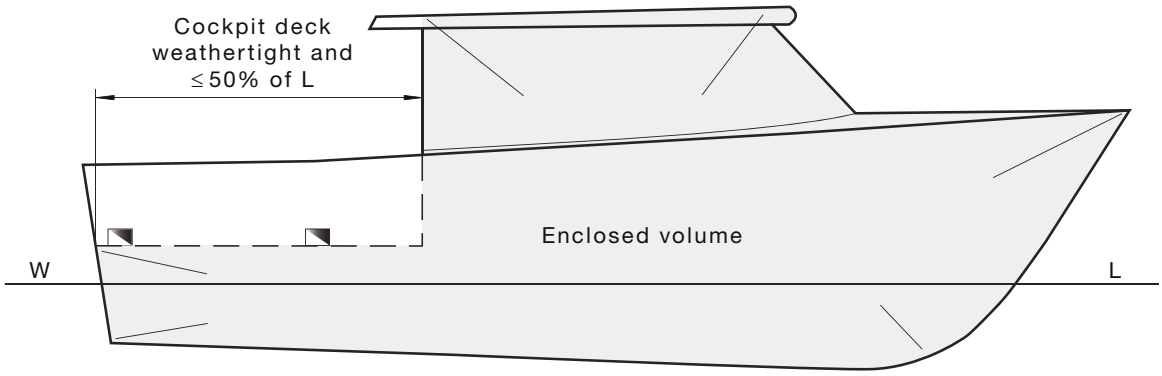
The area of a boat that may be walked upon.

1.3.13 Depth

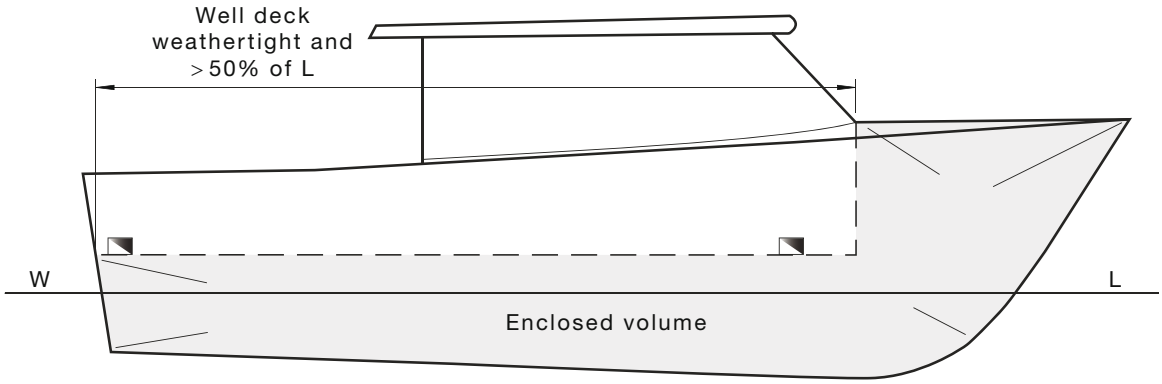
The distance from the upper edge of the gunwale to the inside of the hull measured vertically at the mid-length position at the centre-line.

1.3.14 Drain

A pipe or tube from a deck or cockpit to drain water overboard.



(a) Cockpit boat



(b) Well deck boat

FIGURE 1.1 DIFFERENCE BETWEEN COCKPIT AND WELL DECK BOATS

1.3.15 Flotation material

Material with a density less than water, used to provide buoyancy when the boat is swamped.

NOTE: The density of flotation material is expressed in kilograms per cubic metre.

1.3.16 Forward reference area

That portion of the gunwale or deck the greater value of either 600 mm or 0.1 *L* aft of the moulded line of the stem, measured at the gunwale or deck as appropriate (See Figure C1).

NOTE: *L* is the length of the boat, in metres.

1.3.17 Freeboard

The minimum distance between the waterline and the weather deck at the maximum load capacity.

1.3.18 Freeing ports

Any direct opening through a boat's bulwarks above the weather deck to rapidly drain water overboard.

1.3.19 Fully decked boat

A boat in which the horizontal projection of the sheerline comprises any combination of—

(a) watertight deck and superstructure;

(b) quick-draining recesses; and

(c) watertight recesses;

all closing appliances being watertight.

1.3.20 Fully enclosed boat

A fully decked boat with one or more accessible spaces that are capable of being closed up to become watertight.

NOTE: A boat in which all spaces below the weather deck are used solely as buoyancy compartments (either air chambers or housing for flotation materials) is not a fully enclosed boat.

1.3.21 Gear

Personal equipment including clothing, provisions and water.

NOTE: An allowance is made for personal gear (see Section 2).

1.3.22 Length (*L*)

The overall length of the boat's hull, determined in accordance with ISO 8666.

1.3.23 Level flotation

A flotation system that will keep a boat carrying its maximum load from sinking when swamped, assuming the occupants remain within the boat and supported by the flotation system. Level flotation implies that the swamped boat will float level and not capsize in calm water, but level flotation does not imply a self-righting capacity.

1.3.24 Maximum load capacity (outboard installations)

The maximum mass, including motor, accessories and fuel, ancillary equipment, persons and gear that the boat is designed to carry, expressed in kilograms.

1.3.25 Maximum persons capacity (*C*)

The maximum load of persons, expressed as the number of average size adults, that the boat is designed to carry.

1.3.26 Maximum power capacity

The power rating of the largest outboard motor suitable for use with the boat. The power rating is expressed in kilowatts.

1.3.27 Mid-length (amidships)

The mid-point of the boat's length.

1.3.28 Open boat

A boat not protected from the entry of water by means of a complete weather deck or a partial weather deck and a weathertight or watertight cabin, such that the deck, cockpit or well bottom is open to the bilge and cannot drain overboard.

1.3.29 Open waters

Bodies of water other than protected waters.

1.3.30 Outboard motor

A self-contained propulsion unit, usually mounted over the stern of a boat.

1.3.31 Power boat

A mechanically powered boat.

1.3.32 Protected waters

Lakes, rivers, bays, estuaries and similar bodies of water protected from the full force of the weather in most prevailing weather conditions where the wave height does not exceed 0.5 m under normal conditions.

NOTE: State regulatory authorities define areas of 'sheltered waters' (normally Operational Areas D and E) and in many cases these are equivalent to 'protected waters'.

1.3.33 Reference length

The length from the forward face of the stem at the static float plane to the vertical midpoint of the transom below the static float plane measured parallel to the static float plane. Reference length is denoted by 'L_R', and is expressed in metres

NOTE: See Figure A1, Appendix A.

1.3.34 Reference plane

A plane passing through the points denoted by the intersections of the forward face of the stem and the aft face of the transom with the sheer.

1.3.35 Reserve buoyancy

The force that causes a boat to float when swamped, expressed in newtons.

1.3.36 Self-draining cockpit

A cockpit that is watertight to the hull interior and drains overboard through drains or freeing ports.

1.3.37 Sheer

The fore-and-aft curve of a boat's deck.

1.3.38 Static float plane

A plane parallel to the reference plane passing through the lowest point of the weather deck (see Figure 1.2).

1.3.39 Stability

The ability of the boat to return to its normal attitude.

1.3.40 Superstructure

Housing located above and attached structurally to weather decks, e.g. cabin sides, ends and tops.

1.3.41 Watertight

Constructed to provide effective protection against water seepage when closed and exposed to continuous driving rain or waves (see Appendix E).

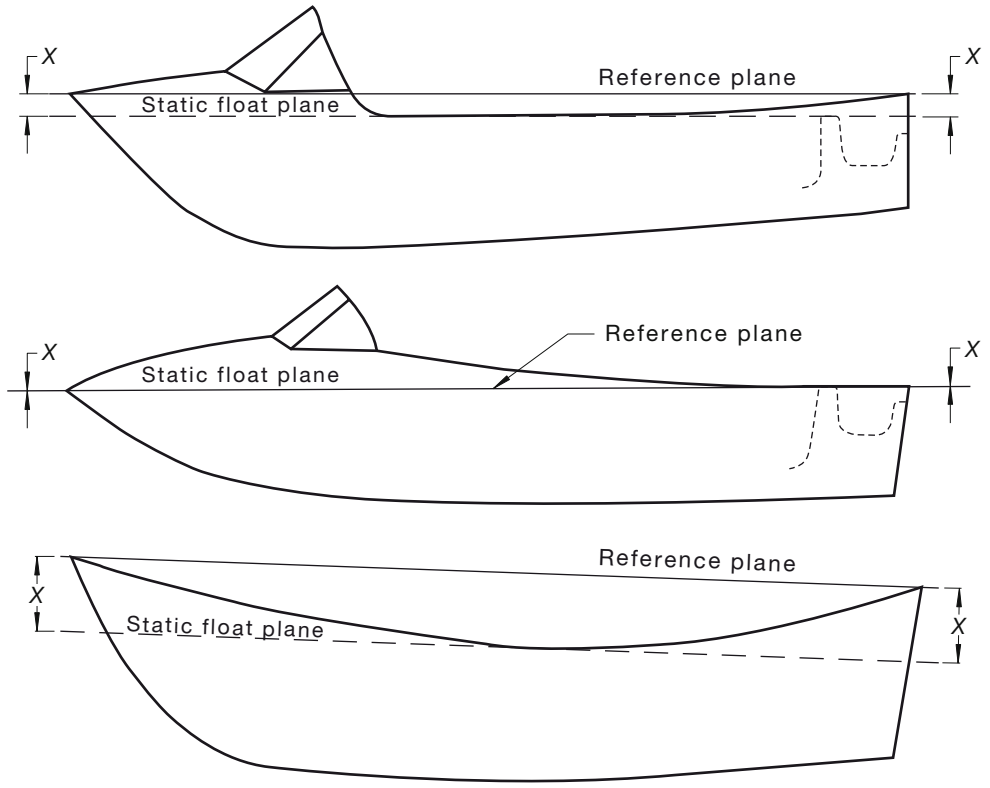


FIGURE 1.2 STATIC FLOAT PLANE

1.3.42 Weather deck

The uppermost continuous deck exposed to the weather or, if the boat is not fully decked, the uppermost partial deck exposed to the weather.

NOTE: In a typical cabin cruiser, weather decks would be the bow, side and stern decks. Trunk cabin roofs should be considered weather decks on boats designed for off-shore service.

1.3.43 Weathertight

Constructed to provide effective protection against water seepage when closed and exposed to ordinary rain or spray (see Appendix E).

1.3.44 Well deck boat

A boat having an exposed recess, which extends for more than 50% of the length of the boat (see Figure 1.1).

1.3.45 Yacht

A boat designed primarily for sailing.

1.4 MARKING

1.4.1 Boat capacities

1.4.1.1 *Australian Builders Plate*

Boats shall be fitted with an Australian Builders Plate in accordance with the National Standard for the Australian Builders Plate for Recreational Boats. The maximum power, load and persons capacity shown on the plate shall not be greater than that determined in accordance with this Standard.

NOTE: The manufacturer may nominate a lower maximum load and persons capacity than the value calculated in accordance with Sections 2 and 6, as appropriate. This reduction may be desirable for a range of reasons, such as limitations on seating and accommodation or a decision that it would be prudent not to approach the boat's limits. A similar situation would apply with outboard boats and the nominated maximum power capacity.

1.4.1.2 *Plates restricting numbers of persons in particular places*

In addition to the Australian Builders Plate, boats incorporating flying bridges and other features that could affect the stability of the boat shall carry a plate restricting the number of persons on each such deck or place.

NOTE: These restrictions may be taken into account when performing the heeling test set out in Clause 5.3.

1.4.2 Hull identification

A unique craft identification number (CIN) complying with AS 4393 shall be permanently and legibly marked on the hull.

NOTE: Details of the CIN/HIN system are available from State Marine Authorities.

1.5 ISO RELATIONSHIP

Where reference is made to ISO standards in AS 1799.1 (this Standard), requirements applying to recreational boats operating in protected waters shall be considered as indicating ISO Design Category C *Inshore*, and requirements applying to recreational boats operating in open waters shall be considered as indicating ISO Design Category B *Offshore*.

SECTION 2 MAXIMUM CAPACITIES AND BUOYANCY

2.1 MAXIMUM LOAD CAPACITY FOR BOATS UP TO 6 m FOR PROTECTED WATERS

2.1.1 General

The maximum load capacity shall be determined in accordance with Clause 2.1 for boats up to and including 6 m in length operating in protected waters. There may be occasions where the boat will be required to carry a load other than passengers (e.g. a tender carrying supplies from shore to a larger vessel on a mooring), or the passengers may not correspond to the average persons mass and, for these reasons, the maximum load capacity of the boat is the key consideration. The maximum load capacity determined in accordance with Clause 2.1 is for protected waters only and makes no allowance for stability considerations or prevailing conditions.

NOTE: The maximum load capacity for boats over 6 m, and boats operating in open waters, is generally determined by stability and load distribution considerations. The maximum load of passengers, their equipment and other loads on such boats may be determined using the applicable requirements of Clauses 5.3 and 5.4.

2.1.2 Outboard installations

The maximum load capacity for boats up to and including 6 m in length shall be calculated in kilograms, and shall be determined by calculating or measuring the cubic capacity below the static float plane, converting this volume to the mass of water it would displace, subtracting the mass of the boat, including the filled mass of any installed fuel tanks, and allowing 1 kg of load capacity for each 5 kg of remaining displacement.

NOTE: A suitable method of calculation is given in Paragraph A2 of Appendix A.

For boats with a maximum power capacity not greater than 1.5 kW, an allowance of 1 kg of load capacity for each 3 kg of remaining displacement may be used.

2.1.3 Inboard installations

The maximum load capacity for boats up to and including 6 m in length shall be calculated in kilograms, and shall be determined by calculating or measuring the cubic capacity of the boat below the static float plane, converting this volume to the mass of water it would displace, subtracting the mass of the boat, excluding the mass of the engine, fuel tank and fuel, allowing 1 kg of boat load capacity for each 5 kg of remaining displacement, and finally subtracting the mass of the engine, fuel tank and fuel to obtain the maximum load capacity.

NOTE: A suitable method of calculation is given in Paragraph A3 of Appendix A.

2.2 MAXIMUM PERSONS CAPACITY FOR PROTECTED WATERS

2.2.1 General

The maximum persons capacity provides a quick guide to the number of adults that can be safely carried when operating in protected waters. It is derived using an average value for the mass of a passenger and the allowance for the mass of ancillary equipment and personal gear on board. It should therefore be treated with some caution and where doubt exists, the maximum load capacity should be used as the indicator of the boat's true capacity. The maximum persons capacity for protected waters shall be determined as follows:

(a) For boats up to and including 6 m in length, by using the method set out in Clause 2.2.2 or Clause 2.2.3 with appropriate reduction in capacity, if necessary, to comply with the stability requirements of Section 5.

(b) For boats over 6 m in length, by estimating the persons capacity and modifying this value, as necessary, to comply with the appropriate stability requirements of Section 5 for protected waters.

NOTE: An allowance of 80 kg is made for the body mass of each adult with an additional allowance of 10 kg per person for ancillary equipment and personal gear.

2.2.2 Outboard installations

The maximum persons capacity (C) for boats up to 6 m in length shall be stated as the number of average adults and shall be determined by the following method:

(a) Take the maximum load capacity and subtract the assumed mass of the largest outboard motor (including controls) for which the boat is rated including the mass of batteries, obtained from Table 2.1. For boats without installed fuel tanks, also subtract the mass of the portable fuel tank and fuel as shown in Column 4 of Table 2.1.

(b) Divide the result by 90 kg, and take the lower whole number, thus obtaining the maximum number of average size adults.

2.2.3 Inboard installations

The maximum persons capacity (C) shall be determined by taking the maximum load capacity, dividing by 90 kg and taking the lower whole number, thus obtaining the maximum number of average size adults.

2.3 MAXIMUM PERSONS CAPACITY FOR OPEN WATERS

The maximum persons capacity in open waters shall be determined by reducing the capacity calculated for protected waters as necessary to comply with the appropriate stability requirements of Section 5 for open waters.

TABLE 2.1

MASSES OF PETROL OUTBOARD MOTORS AND RELATED EQUIPMENT FOR VARIOUS MAXIMUM POWER CAPACITIES

1		2	3	4	5	6	7
Maximum power capacity		Mass, kg					
HP	kW	Motor and controls	Battery	Portable fuel tank and fuel	Total mass	Submerged mass	Swamped mass
0–2.0	0–1.5	15	0	0	15	10	12
2.1–3.9	1.6–2.9	18	0	0	18	12	15
4.0–7.0	3.0–5.2	41	0	11	52	30	35
7.1–15.0	5.3–11.2	60	10	22	92	55	50
15.1–25.0	11.3–18.7	108	20	22	150	90	90
25.1–45.0	18.8–33.6	125	20	45	190	115	125
45.1–60.0	33.7–44.8	165	20	45	230	140	140
60.1–75.0	44.9–56.0	190	20	45	255	155	160
75.1–100.0	56.1–74.6	210	20	45	275	165	175

(continued)

TABLE 2.1 (*continued*)

1		2	3	4	5	6	7
Maximum power capacity		Mass, kg					
HP	kW	Motor and controls	Battery	Portable fuel tank and fuel	Total mass	Submerged mass	Swamped mass
100.1–145.0	74.7–108.2	270	20	45	335	200	210
145.1–220.0	108.3–164.1	275	20	45	340	205	220
≥220.1	≥164.2	325	20	45	390	235	265
50.0–90.0*	37.6–67.2	250	40	45	335	200	210
90.1–120.0*	67.3–89.6	325	40	45	410	245	272
120.1–150.0*	89.7–112.0	378	40	45	463	278	317
150.1–200.0*	112.1–149.2	415	40	45	500	300	350
200.1–290.0*	149.3–216.4	540	40	45	625	375	437
290.1–440.0*	216.5–328.2	545	40	45	630	380	440
≥440.1*	≥328.3	695	40	45	780	470	528

* Transom designed for twin motors

2.4 PROVISION OF SEATING AND STANDING POSITIONS

A seating or standing position for use while the boat is under way shall be provided for each person based on the maximum persons capacity. Standing positions shall be at least 450 mm wide and shall be provided with sturdy handholds appropriate to the conditions likely to be experienced based on the speed and operational area of the boat (see Clause 3.11.4). Seating positions shall be on the basis of 475 mm of seating width per person. For boats 4.25 m or less in length, the height of the seat above the keel should be as low as possible, however, allowance should be made for rowing.

2.5 SWAMPED FLOTATION

2.5.1 Minimum swamped flotation

All boats, except those over 6 m in length that are fully enclosed and meet the requirements of Clause 2.5.5, shall be provided at least with basic flotation when swamped in the form of flotation material (closed-cell plastics or equivalent) or air chambers.

Basic flotation shall be demonstrated by a practical test or by calculation using a hydrostatic program. For basic flotation, at least some portion of the hull shall remain above water when the boat is swamped in a condition of maximum persons capacity (as nominated on the Australian Builders Plate), when fitted with the largest motor for which the boat is rated (for outboard engine boats), and with all ancillary equipment and gear in their normal position.

NOTES:

1 The risk of a boat less than 6 m in length being swamped without warning is considered to be sufficiently high that reliance cannot be placed on closing up watertight openings to provide reserve buoyancy.

2 A conservative method for estimating the amount of flotation material needed to provide basic flotation is given in Appendix B.

2.5.2 Use of flotation materials

Flotation materials shall comply with Clause 2.5.3, unless they are located in a position where it is unlikely that they will come into contact with petroleum products or other chemicals used in the construction or operation of the boat, such as within an elevated thwart on an aluminium dinghy.

Where flotation materials are used, an allowance of 10% above the minimum determined for new materials shall be added to cater for the effects of shrinkage and loss of buoyancy over time.

2.5.3 Resistant flotation materials

Resistant flotation materials shall not lose more than 10% of their buoyancy when tested for water absorption, resistance to heat and resistance to fuels in accordance with IMO MSC 81[70].

Polyethylene, polypropylene and polyurethane buoyancy foams complying with commercial vessel requirements of the NSCV shall be deemed to satisfy the requirements of Clause 2.5.3.

NOTES:

1 Polystyrene foam does not meet the requirements of Clause 2.5.3.

2 Buoyancy foams complying with commercial vessel requirements are listed on the NMSC National Register of Compliant Equipment.

2.5.4 Level flotation

In addition to meeting the requirements of Clause 2.5.1 for minimum swamped flotation, boats less than 6 m in length should desirably be provided with level flotation. Where a claim of level flotation is made, the boat shall pass all of the tests when tested in accordance with Appendix C.

NOTE: A suitable method for estimating the amount of flotation material needed to provide level flotation in open boats is given in Paragraph B4 of Appendix B. However, this needs to be verified by a practical test in accordance with Appendix C.

2.5.5 Boats over 6 m in length

Boats over 6 m in length shall be either—

(a) provided with at least basic flotation in accordance with Clause 2.5.1 as well as bilge pumping arrangements in accordance with Appendix D; or

(b) fully enclosed and capable of being closed up to be watertight by means of hatches and doors complying with Clause 3.6, and having flush decks watertight to the hull interior. Where a cockpit is provided, it shall be quick-draining in accordance with Clause 3.5.2.

2.5.6 Air compartments

Wherever practicable, integral void air compartments should be avoided as a means of providing reserve buoyancy. Where such compartments are used, the construction shall be equivalent to that of the surrounding hull structure. Stress raisers shall be avoided, and all compartment-to-hull seams shall be positioned to allow inspection. Where air chambers or compartments are used to provide reserve buoyancy, the requirements of Clauses 2.5.1 and 2.5.4 shall be met excluding the two largest compartments or air chambers.

Each air compartment used to provide reserve buoyancy shall be—

(a) provided with a drain plug complying with Clause 3.2.3 at its lowest point; and

(b) permanently marked with the following words or their equivalent:

‘CAUTION: This air compartment is essential to the flotation of the boat. Do not puncture or attach fittings.’

These requirements apply to all of the air compartments used to provide reserve buoyancy, including the two largest air compartments.

2.6 MAXIMUM POWER CAPACITY

2.6.1 Determination of maximum power capacity (outboard installations)

The maximum power capacity of boats, other than pontoon boats, shall be stated in kilowatts and shall be determined by the following method (see Table 2.2):

(a) Calculate the factor for use in Table 2.2 by multiplying the overall boat length in metres by the transom width in metres. The transom width shall not exceed the widest measurement of the transom in that part which is below the point of ingress of water. If spray rails act as chines or part of the planing surface, they may be included in the transom width, but otherwise fins and flare shall be excluded. Where a boat has a rounded stern, for the transom width substitute the maximum width below the static float line measured at a point one quarter of the boat length forward of the stern.

(b) Use the factor to determine the corresponding maximum power capacity direct from Table 2.2, or, if the factor is over 5, calculate the maximum power capacity by multiplying the factor and subtracting as shown in the table. If the factor is over 5, and the calculated power capacity is not a multiple of 5, the calculated power capacity may be raised to a multiple of 5 to accommodate power ranges of stock engines. For flat-bottomed hard chine boats, the maximum power capacity shall be reduced by one increment (of power capacity in Table 2.2) for factors below 5.

(c) The power capacity determined in accordance with Items (a) and (b) above shall be adjusted in accordance with Clause 5.2.3.

TABLE 2.2

DETERMINATION OF POWER CAPACITY

Type of boat	Factor	Power capacity, kW
All types (except flat bottom, hard chine boats)*	≤2.25	1.5
	>2.25 ≤3.3	3.0
	>3.3 ≤3.6	4.0
	>3.6 ≤3.9	5.25
	>3.9 ≤4.2	7.5
	>4.2 ≤5.0	12.0
Remote steering and 500 mm transom or equivalent	>5.0	[(16 × factor) – 67]†
No remote steering or transom less than 500 mm or equivalent—		
Flat-bottomed hard chine boats	>5.0	[(4 × factor) – 11]†
Other boats	>5.0	[(6.5 × factor) – 20]†

* For flat-bottomed hard chine boats with factors below 5, the power capacity is reduced to the next lower value.

† Power capacity is increased to next multiple of 5.

2.6.2 Determination of maximum power capacity of pontoon boats

The maximum power capacity of outboard powered boats up to 6 m in length with circular cross-section pontoons shall be stated in kilowatts and shall be determined using the following formula:

$$P = \frac{2.5\ V_{\mathrm{h}} L_{\max}}{\varphi}$$

where

P = maximum power capacity, in kW

V_{h} = volume of all pontoons, in cubic metres

L_{max} = length of longest pontoon, in metres

ϕ = pontoon diameter, in metres

The maximum power capacity may be rounded up to the next multiple of 5. For boats with pontoons that are not circular in cross-section, calculate the diameter of a circle of the same area. Where pontoons are made up of tubes that vary in geometric shape over the boat's length, add the calculated diameters together and divide by the number of tubes.

The maximum power capacity for pontoon boats over 6 m in length shall be determined by test in accordance with Clause 5.2.3.

The method set out in Clause 2.6.1 shall be used for catamaran hulled power boats, other than pontoon boats.

2.6.3 Tiller steered outboard installations

A1

If tiller steering is offered as an option and the maximum speed of the boat (in knots) when fitted with the largest outboard motor for which the boat is rated is greater than v_{nom}, then the boat shall meet the requirements of Appendix F with the boat tiller steered.

$$v_{nom} = 7\sqrt{\mathrm{L}}$$

where

v_{nom} = nominated speed, in knots

L = length of boat, in metres

2.6.4 Determination of maximum power capacity (inboard and sterndrive installations)

The maximum power capacity for inboard and sterndrive installations shall be determined by test in accordance with Clause 5.2.3.

2.6.5 Engine power rating

Engine power ratings referred to in Clauses 2.6.1 to 2.6.4 shall be determined by one of the following methods and expressed in kilowatts:

(a) ISO 8665.

(b) AS 4594.1 and AS 4594.3.

NOTE: One horsepower equals approximately 0.746 kW.

SECTION 3 HULL DESIGN

3.1 GENERAL ARRANGEMENT

The design of a boat should take into account all aspects of construction, power, accommodation, access and egress, and the stowage of equipment in the safest and most effective manner. Reference should be made to recognised national and international standards when considering structural and engineering design.

Where boats are fitted with inboard engine installations, reference should be made to recognised national and international standards for ventilation requirements.

3.2 HULL DRAINAGE

3.2.1 Bailing devices

Each boat shall be fitted with an efficient bilge-pumping system complying with the requirements of Appendix D, except in the following cases:

(a) An open boat of length not greater than 6 m where there is no subdivision of the bottom (e.g. by means of floors), in which case buckets or bailers may be used in lieu of a bilge pumping system.

(b) A fully self-draining boat that may be capsized through 360° about a horizontal axis without allowing the entry of any water below its weather deck and in which all spaces below the weather deck are used solely as buoyancy compartments.

NOTE: Statutory authorities in each State may have mandatory requirements in respect of bailing equipment which must be carried by recreational craft.

Boats not fitted with bilge pumping arrangements shall be fitted with adequate drain plugs to permit water to be drained from the hull. In that case, suitably placed, accessible limber holes of adequate size should be provided to enable the hull to be efficiently drained without excessive tilting.

Venturi or other similar types of automatic bailing devices shall be of such a type as to prevent flooding by syphon effect or when the boat is stopped.

3.2.2 Compartments

Boats with watertight or weathertight compartments shall be provided with drainage from each compartment. The arrangement shall be such that water cannot penetrate from one watertight or weathertight compartment to another through the bilges when the drain plugs are in place.

3.2.3 Drain plugs

Drain plugs may be either threaded or have an equivalent mechanical means of sealing, and shall comply with the following requirements:

(a) The drain plug fitting shall be designed and installed so that with the drain plug correctly fitted the watertight integrity of the hull is not compromised.

(b) Drain plugs shall be captive, readily accessible for inspection, and easily operable by hand.

(c) Plugs and barrels shall be manufactured of corrosion-resistant materials.

(d) The means provided to lock the plug in position shall have sufficient friction to prevent accidental removal.

(e) Friction-fit plugs shall not be used.

(f) Elastomeric sealing members should be compounded to resist attack from salt water, petroleum products, sunlight, ozone, marine growth or reaction with metal components. The sealing member should also resist compression set and maintain sufficient resilience to return quickly to the relaxed form for easy removal from the hull. It should not adhere to the drain tube.

3.3 DECKS

3.3.1 General

Weather decks shall be watertight. Weather decks should be provided with sheer or camber. Excessive sheer or camber should be avoided on frequently used decks.

3.3.2 Footing

Weather deck areas intended to be frequently walked upon shall have a slip-resistant surface, and have at their outboard edges a toe rail or other suitable means to help prevent loss of footing.

3.4 SELF-DRAINING COCKPITS AND WELLS IN WEATHER DECKS

3.4.1 General

On fully decked boats with cockpits or wells, a sufficient number of drains or freeing ports shall be provided to free the wells or cockpits of water. The height of the cockpit or well deck above the waterline shall be such that the area is self-draining under all normal conditions of heel and trim that the boat may reasonably experience. Suitable arrangements shall be made to drain loose water away from the seals of any flush-type hatches.

Doors to enclosed accommodation from unprotected cockpits shall have sills not less than 50 mm in height above the cockpit deck.

3.4.2 Drain area

Where drains are provided, the minimum effective cross sectional area of each drain shall not be less than 800 mm^2. The total effective area of all drains in a well or cockpit shall not be less than 700 mm^2 per square metre of cockpit or well deck area including the area of any lockers or compartments that drain into the cockpit or well.

3.4.3 Drain construction

Drains of the scupper type should be designed as follows:

(a) Drains should be easy to clear, without restriction, and with as few bends and fittings as practicable.

(b) Flexible sections may be used to avoid fatigue failure. Care should be taken to ensure that drains situated below the weather deck that incorporate a flexible section are designed in such a way that failure of the flexible section will not result in flooding of the hull.

(c) Drains may discharge above or below the waterline, but if below the waterline they shall be provided with a suitable fitting to prevent back-flooding.

(d) Where required, deflectors should be used to prevent water backing up when the boat is under way. Drains shall be constructed as follows:

  (i) Where non-return flap fittings are provided, they shall be clearly visible and accessible.

  (ii) Materials shall be protected against salt water corrosion and shall comply with Clause 3.13.

  (iii) Where strainers are fitted to drains, the clear area of the strainer shall be at least 50% greater than the required minimum effective area of the drain discharge.

3.4.4 Drainage around hatches over engine compartments

All weathertight, flush engine hatches shall be provided with channels or gutters to collect seepage around their edges. Collected seepage should discharge overboard where practicable, but in any event it shall discharge clear of the engines and the electrical systems.

3.5 QUICK-DRAINING COCKPITS, WELLS AND RECESSES

3.5.1 General

It is desirable that recesses on fully-decked boats are quick-draining. However, this may not be practicable on boats less than 6 m in length.

Recesses in weather decks of fully-decked boats that do not meet the quick-draining requirements of Clause 3.5.2 should not have a total volume greater than Q, calculated as follows:

$$Q = 0.2\,LBf$$

where

Q = combined volume of all non-quick-draining watertight recesses, in cubic metres

L = length of boat, in metres

B = beam, in metres

f = freeboard when upright, in metres

3.5.2 Time to drain water

Cockpits, wells and recesses shall be considered quick-draining if, with the boat upright, the time to drain the cockpit from the full height of water, down to 5% of V_C, or to the level of the lowest sill at an opening to the hull (whichever is more stringent) is less than t, calculated as follows:

A2

$$t = \frac{0.45LBf}{V_C}$$

where

t = the maximum allowable time to drain, in minutes

V_C = volume of cockpit, in cubic metres

L = length of boat, in metres

B = beam, in metres

f = freeboard when upright, in metres

If t, calculated above, is greater than 5, a value of 5 shall be used.

Provision of freeing ports complying with Clause 3.5.3 at the level of the cockpit deck is deemed to satisfy the requirements for quick-draining and a test of drainage time is not required.

3.5.3 Freeing port area

Where freeing ports are provided to achieve compliance with Clause 3.5.2, the area required on each side of the boat for each well shall not be less than P, calculated as follows:

$$P = 0.02\ (lb)$$

where

P = area of freeing ports, in square metres

l = length of the well, or cockpit, in metres

b = height of bulwark or depth of cockpit, in metres

3.5.4 Freeing port construction

Freeing ports for well decks shall be arranged throughout the length of the bulwarks. The lower edges shall be as near to the deck as practicable and the openings shall be protected by bars spaced not more than 230 mm apart or by other equivalent arrangements.

3.6 HATCHES AND EXTERIOR DOORS

3.6.1 Design of hatches and exterior doors

Hatches and exterior doors shall comply with the following requirements:

(a) Hatches in cabin tops and doors in superstructures, except as indicated in Item (c), shall at least be weathertight closures.

(b) Hatches on weather decks shall be watertight except where the compartment under the hatch is watertight and self-draining overboard, in which case the hatch may be weathertight.

(c) Exterior forward-facing doors and side doors in the superstructure or in trunk cabins shall be watertight.

3.6.2 Construction of hatches and exterior doors

Watertight and weathertight hatches and doors shall be constructed so as to be at least equal in strength to the parts of the boat to which they are attached. Watertight hatches and doors fitted with devices for jamming or locking them against gaskets shall have sufficient strength to prevent deformation by the jamming or locking devices.

The required tests for weathertightness and watertightness are given in Appendix E.

3.6.3 Coamings and sills

Hatches and similar access openings in a weather deck that are intended to be opened at sea shall have coamings not less than 50 mm high for protected waters and 150 mm for open waters. Flush type hatches that incorporate gasketed and clamped covers capable of being closed up to be watertight may be used in applications where they are not normally required to be opened at sea.

3.6.4 Security of attachment of hatch covers

Means shall be provided to prevent the hatch from coming adrift from the boat. Hinges, chains or other devices used to prevent a hatch from coming adrift shall be secured to a hatch coaming with through bolts, or with fastenings that provide the same security as through bolts.

3.7 EXITS FROM ENCLOSED ACCOMMODATION

Every boat having enclosed accommodation shall have means of exit at each end of the overall accommodation area.

For boats up to 7.5 m in length, the area of the aperture shall be not less than 0.2 m^2 with no side less than 400 mm.

Unless it is sliding, the door or hatch cover shall open outwards. The escape hatch shall be possible to easily open from inside at all times and possible to open from outside when the hatch is secured but not locked. The exit shall open to a clear unobstructed space.

Boats over 7.5 m shall comply with the requirements for escape routes from accommodation spaces specified in ISO 9094.

3.8 WINDSHIELD AND WINDOWS

The windshield and windows shall comply with the following requirements:

(a) The windshield and windows shall be of safety glass or laminated safety glass complying with AS/NZS 2080, or a material having at least equivalent safety characteristics on fracture to those specified in AS/NZS 2080.

(b) Windows or ports that face forwards or to the side shall be watertight.

(c) Watertight and weathertight windows and ports shall be constructed and installed so as to be at least equal in strength to the parts of the boat in which they are installed.

(d) Windshields and side windows that cannot be seen over and are located from forward to 22.5° abaft the beam on either side of the steering position shall not be colour tinted and shall have a light transmission of not less than 70%.

NOTE: Typically, grey tints are the most suitable tints to fulfil this criterion.

(e) Every windshield or forward window at a steering position shall be so fitted that in heavy rain it can be seen over, opened, or part opened so that visibility can be maintained. Alternatively, windscreen wipers or clear view screens shall be provided.

3.9 TRANSOM FOR OUTBOARD OR STERNDRIVE INSTALLATIONS

The transom shall be capable of absorbing and transmitting to the hull of the boat all of the loadings imposed on it by the maximum power motor recommended for the boat as well as the loadings imposed while being trailed.

NOTE: Support for the motor may be provided on the trailer.

3.10 MOTOR WELL

The motor well, where provided, shall raise the static float plane above the transom cutout. Steering and motor accessory ports shall be located as high as possible with an aggregate area as small as possible but not exceeding 100 cm^2, and shall be capable of being protected against excessive water entry. The well shall be watertight to the hull interior and have drain holes through the transom of sufficient size to allow water to drain rapidly. The motor well shall be dimensionally suitable for all motors it is intended to carry, and shall comply with the requirements of the motor manufacturer in this regard.

3.11 BOAT HARDWARE AND FITTINGS

3.11.1 General

Boat hardware and fittings shall comply with the following requirements:

(a) Be of sufficient strength to withstand the maximum loads likely to be applied in normal and emergency service.

(b) Be of a size and design to permit easy use, particularly with regard to the attachment of lines.

(c) Be resistant to deterioration by corrosion or weather.

(d) Be free of sharp edges or dangerous features that could cause injury.

Consideration should be given to the possibility of injury in a collision or in severe conditions.

All load-bearing fittings shall be welded or through-fastened with bolts (or other positive through fastening methods) and secured so that they cannot become damaged or work loose in service. All fittings shall be adequately backed with reinforcements so that the applied loads will be distributed to the adjacent structures.

3.11.2 Bow eye

Each trailerable boat shall be fitted with a bow eye or other fitting suitable for use in towing by other craft, or for attachment to the bow post of a trailer. The bow eye shall be able to withstand a direct tensile load equivalent to twice the weight of the fully loaded boat. The bow eye shall be located above the waterline and shall be through-fastened with bolts or welded to the stem. Where such eyes are not accessible from within the boat in adverse weather or because of raked stems or for other reasons, an additional towing point, accessible from within the boat, shall be provided.

3.11.3 Cleats, bollards and fairleads

Each boat shall be provided with deck or hull fittings fore and aft to permit easy and speedy fastening of lines for mooring, anchoring and making fast alongside. Fairleads and cleats should be provided for, in additional positions, on larger craft.

Mooring fittings shall be sized to suit lines of the minimum sizes indicated in Table 3.1, and shall be attached with strengths in shear as indicated. The main forward mooring bollard shall be arranged to withstand a towing load equivalent to three times the weight of the fully loaded boat.

Fittings shall be accessible and should be positioned to avoid interference with normal movement of persons around the deck of the craft.

TABLE 3.1

MINIMUM SIZE AND ATTACHMENT STRENGTH OF FITTINGS

Boat length m	Line size (dia.) of fitting mm	Attachment strength (shear) kN
≤3.0	≥6	≥2.1
>3.0 ≤4.5	≥8	≥3.3
>4.5 ≤6.0	≥10	≥4.8
>6.0 ≤7.5	≥10	≥6.5
>7.5 ≤10.0	≥12	≥9.5
>10.0 ≤12.0	≥14	≥16.0
>12.0 ≤15.0	≥16	≥21.0

3.11.4 Safety hand rails, handholds and reboarding

Boats shall be fitted with—

(a) substantial handholds in working and passenger spaces in cockpits, decks and cabins and at the control position;

(b) satisfactory means for all persons (within the maximum persons capacity) to hold on to and be supported by the boat when swamped; and

(c) a means of access for reboarding from the water in boats with freeboard greater than 0.3 m. If that means is a ladder, the top of the lowest step shall be at least 300 mm below the waterline when the ladder is extended.

The means of reboarding in item (c) should be capable of being deployed and used without the assistance of anyone on board.

NOTE: The intent of Item (c) is to allow reboarding should the sole occupant of the boat fall overboard.

3.12 LIFTING SYSTEM

Boats intended to be lifted with belly bands or wires should have the lifting positions and the minimum width of bands or diameter of wires to be used clearly marked on the side of the hull. Where a hook and eye type lifting system is provided, it shall comply with the following requirements:

(a) All fittings shall be through bolted (or equivalently attached) to the keel, stem or transom as required.

(b) Eyes shall not be attached to decks or gunwales unless these locations have been specially constructed to take lifting loads.

(c) All fittings used for lifting boats above 7.5 m in length shall have an eye diameter of not less than 32 mm and, when attached to the boat, shall be capable of withstanding a direct tensile force equivalent to twice that applied to the fitting during lifting of the fully loaded boat. In addition, lifting fittings shall be designed and installed to withstand a horizontal load equal to 60% of the vertical requirements in order to withstand loads imposed when the cables do not lift directly upward.

(d) Fittings shall be located so that lifting cables do not damage gunwales or accessories.

(e) Lifting positions should be marked on the hull.

3.13 DISSIMILAR METALS

Except where intended for cathodic protection, dissimilar metals shall not be used in contact with each other in the boat unless suitable precautions are taken to minimize corrosion.

NOTE: Guidance on the selection of suitable alloys is given in AS 1799.3.

SECTION 4 COOKING AND HEATING SYSTEMS

4.1 LIQUEFIED PETROLEUM GAS (LP GAS) AND COMPRESSED NATURAL GAS (CNG) SYSTEMS

4.1.1 General

The installation of any permanently installed liquefied petroleum gas or natural gas system shall be in accordance with the relevant requirements of AS 5601.

4.1.2 Location

The high pressure system (comprising one or more cylinders), high pressure piping and regulator shall be located so that gas escaping from the system cannot reach the bilges, engine compartment, cabin or other enclosed space. LP Gas high pressure systems shall be located on an open deck, cabin top or other external location outside of the cockpit or any semi-enclosures. The system shall be firmly secured and shall be readily accessible. It shall be protected from the weather by a housing vented to atmosphere near the top and the bottom.

4.1.3 Gas detector

A gas detector should be installed adjacent to the cabin sole.

NOTE: AS/NZS 60079.29.1 specifies requirements for instruments intended to detect and measure the concentration of a flammable gas or vapour in areas where a hazard may arise.

4.1.4 Instructions for use

Instructions for the use of the gas system shall be permanently displayed in a position where they will be read by persons using the system. The instructions shall state that the cylinder valve shall be closed when the boat is not in use, or when the system will not be used for a protracted period, and that if there is a gas leak to the hull interior, the boat shall be thoroughly ventilated before any naked lights are used, any part of the electrical system is activated or the engines are started.

4.1.5 Appliances

Appliances for use with LP Gas or CNG systems shall be designed for marine operation and shall be certified to the relevant Standards by an appropriate certifying body.

4.2 SYSTEMS OTHER THAN LP GAS or CNG

4.2.1 General

Petrol (gasoline) shall not be used for heating, cooking or for any other purpose within the accommodation space of the boat. Liquid fuels such as methylated spirits or kerosene may be used provided that the fuels are stored in appropriate containers complying with AS/NZS 2906 or equivalent. Where permanently installed gas systems other than LP Gas or CNG are employed they shall be installed in accordance with the relevant requirements of AS 5601.

4.2.2 Appliances

Stoves and heaters for fuels other than LP Gas or CNG should be designed for marine operation and installed in accordance with the manufacturers' instructions. Instructions for the use of the appliance shall be permanently displayed in a position where they will be read by persons using the appliance.

4.3 APPLIANCES

4.3.1 Cooking appliances

Cooking appliances shall be securely fastened to a metal base. All surrounding surfaces within 250 mm of the burner shall be protected by low flammability material. A drip tray of adequate size shall be provided under the appliance.

4.3.2 Pilot flames

A continuous burning pilot flame shall not be used on any gas-burning appliance when installed below the weather deck.

4.3.3 Water heaters

Open-flame water heaters shall be permitted only where the combustion unit is fitted into a compartment that is sealed from the hull interior, and vented, drained and flued externally.

4.3.4 Cabin heaters

Cabin heaters shall be of the sealed combustion type, fully vented to the outside atmosphere, and with combustion air taken from outside the hull and cabin. Open-flame heaters shall not be used.

4.3.5 Refrigerators

Refrigerators operated by a gas flame shall not be installed below the weather deck.

SECTION 5 STABILITY

5.1 PERSONAL WATER CRAFT

Personal water craft, and other mechanical aids to aquatic sports under 4 m in length, shall comply with one of the following:

(a) ISO 13590; or

(b) The requirements of Clause 5.2.

5.2 PROTECTED WATERS REQUIREMENTS FOR BOATS UP TO 6 m

5.2.1 General

Monohull power boats of length up to and including 6 m, other than those specified in Clause 5.1, shall comply with the requirements of Clauses 5.2.2 and 5.2.3.

5.2.2 Stability under static conditions

When determining the load and persons capacity for protected waters of a boat under 6 m in length, the following requirements shall be met:

(a) *Boats under 3.75 m in length* The boat shall not ship water when loaded in the following way in smooth water:

(i) A mass equivalent to the mass of the largest engine for which the boat is rated, including fuel tanks and fuel (for outboard engines the total mass given in Column 5 of Table 2.1) is located in the normal position.

(ii) All onboard equipment supplied with the boat is aboard.

(iii) An allowance of 10 kg per person for ancillary equipment and gear is located in the normal stowage areas.

(iv) A mass equivalent to 50% of the maximum persons capacity (in kilograms) calculated at 80 kg per person is located on the centreline of the boat (see Table 5.1).

(v) A mass equivalent to 50% of the maximum persons capacity (in kilograms) is distributed as far to one side as possible in the space for, and in the normal position of, persons (see Table 5.1).

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 cutouts not provided with motor wells, and, in the case of fully enclosed boats, into the normal passenger carrying space, including self-draining cockpits.

(b) *Boats of length from 3.75 m up to and including 6 m* The 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:

(i) A mass equivalent to the mass of the largest engine for which the boat is rated, including fuel tanks and fuel (for outboard engines the total mass given in Column 5 of Table 2.1) is located in the normal position.

(ii) All onboard equipment supplied with the boat is aboard.

(iii) An allowance of 10 kg per person for ancillary equipment and gear is located in the normal stowage areas.

(iv) A mass equivalent to 50% of the maximum persons capacity (in kilograms) calculated at 80 kg per person is located on the centreline of the boat (see Table 5.1).

(v) A mass equivalent to 50% of the maximum person capacity (in kilograms) is distributed as far to one side as possible in the space for, and in the normal position of, persons (see Table 5.1).

TABLE 5.1
LOADING ARRANGEMENTS

Number of persons	Persons on centre-line	Persons on one side
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' specified in item (v) means that if weights are used instead of people, each 80 kg 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.

5.2.3 Maximum power capacity and general seaworthiness

A1 Where the maximum power capacity is to be determined by test, the requirements in Appendix F shall apply. The maximum power capacity determined by calculation in accordance with Clauses 2.6.1 or 2.6.2 may be adjusted in accordance with Appendix F.

5.3 PROTECTED WATERS REQUIREMENTS FOR BOATS OVER 6 m AND OPEN WATERS REQUIREMENTS

5.3.1 General

Monohull power boats of length greater than 6 m shall comply with the requirements of Clause 5.3.4 when tested in accordance with Clause 5.3.2 to verify the maximum persons capacities for protected waters and for open waters.

Where a monohull power boat of length up to and including 6 m is required to have a maximum persons capacity rating for open waters, the boat shall comply with the requirements of Clause 5.3.4 when tested in accordance with Clause 5.3.2 using the greater of the passenger heeling moment and the open waters wind heeling moment specified in Clause 5.3.3.

5.3.2 Heeling test

The boat shall be subjected to the greater of the two heeling moments (passenger or wind) set out in Clause 5.3.3 under the following conditions:

(a) The mass of the occupants and gear, based on the maximum persons capacity, C, and calculated at 90 kg per person (i.e. 80 kg body mass plus 10 kg 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.

(b) On boats having non-return closures in cockpit drains or on weather deck drains, such closures shall be restrained in the open position during the course of the test.

5.3.3 Heeling moment

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

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

where

H_p = passenger heeling moment, in newton metres

W = total mass of occupants, in kilograms

B = 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 protected waters

= 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

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.

NOTE: To convert newton metres to kilogram (*F*) metres, divide by 9.8.

5.3.4 Requirements

5.3.4.1 *Angle of heel*

When subjected to the heeling test described in Clause 5.3.2, a boat shall not heel by more than 14°.

5.3.4.2 *Loss of freeboard*

When subjected to the heeling test, the loss of freeboard due to heel measured at the point of least freeboard shall not exceed the following:

(a) 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.

(b) 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. On boats where the drains or freeing ports are located at the transom and have self-closing flaps, immersion to the full 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 and any drains.

(c) On cockpit boats the freeboard shall be measured to the top of the gunwale. The maximum allowable reduction in freeboard shall be calculated by—

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

where

f = freeboard when upright, in metres

L = length of boat, in metres

l = length of cockpit, in metres

(d) 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.

5.4 MULTIHULL BOATS

5.4.1 General

Multihull power boats shall have at least basic flotation in accordance with Section 2 and shall comply with the requirements of Clauses 5.4.2 and 5.4.3.

5.4.2 Freeboard

The minimum freeboard measured from the load waterline to the lowest point of the deck of each hull shall be such that there is a reserve hull volume of at least 50% of the total volume of the hulls up to the lowest point on the deck (see Figure 5.1).

For pontoon craft designed to be used solely on inland waterways, the reserve buoyancy required for a sealed and pressure tested compartment may be reduced to 25%.

A suitable method for determining compliance with this requirement is set out below:

(a) Calculate the total volume of each hull compartment up to the static float plane.

(b) Multiply the volume of each compartment by 0.5 for non-sealed and 0.25 for sealed compartments.

(c) The sum of the resulting volumes from Item (b) is the required reserve volume for the boat.

(d) Calculate the total volume of the hulls between the load waterline and the static float plane.

(e) Compliance is achieved where the result from Item (d) is greater than or equal to the result from Item (c).

5.4.3 Heeling test

The boat shall be subjected to an heeling test as follows:

(a) The boat shall be loaded to its maximum persons capacity, calculated at 90 kg per person (i.e. 80 kg per person plus 10 kg allowance for gear).

(b) With the maximum persons capacity load evenly distributed in the boat, the freeboard is to be measured at the lowest point of the deck.

(c) With 80 kg 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.

(d) The freeboard measured in Item (c) shall not be less than one quarter of that measured in Item (b) and in no case less than 75 mm.

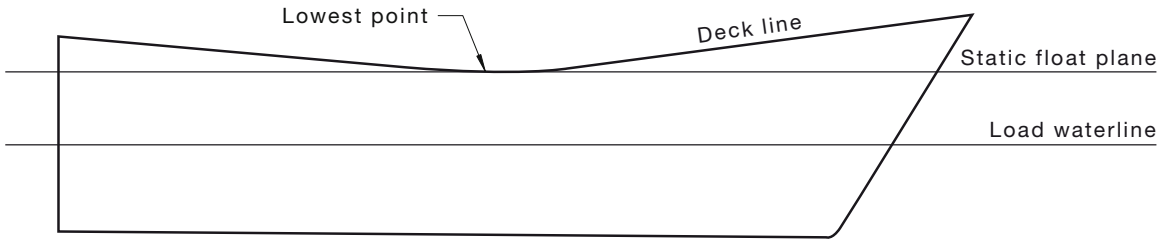


FIGURE 5.1 MULTIHULL RESERVE HULL VOLUME

SECTION 6 FIRE PROTECTION

6.1 PORTABLE FIRE EXTINGUISHERS

6.1.1 Selection

The type of fire extinguishers to be carried on a boat shall be appropriate to the type of fires likely to be encountered.

NOTE: Guidance on the selection of suitable fire extinguishers is given in AS 2444, and in Appendix G.

6.1.2 General

All boats that are powered by a motor should carry at least one extinguisher of rating not less than 5B.

6.1.3 Large tanks

Boats that use petrol and have fuel tanks of capacity greater than 25 litres should carry at least one extinguisher of rating not less than 20B.

6.1.4 LP Gas or other flammable gases

Boats that carry LP Gas or any other flammable gas on board should carry an additional extinguisher that is recommended by the manufacturer as being suitable for flammable gas fires (Class C) and has a rating not less than 10B, located in the area of the appliance that uses the gas.

6.1.5 Flammable liquids

Boats that carry kerosene, methylated spirits, or other low flash-point liquid below decks should carry an additional extinguisher of rating not less than 5B located in the area of the appliance that uses the liquid.

6.1.6 Boats with accommodation

Boats that have sleeping accommodation should carry an additional extinguisher of rating not less than 2A, located near the exit to the sleeping compartments.

6.1.7 Location and mounting

Portable fire extinguishers shall be located so they are easily identifiable and readily accessible from outside the compartment they are intended to serve. Recommended positions are at the helmsman's station adjacent to the galley area and engine compartment and near the exit to sleeping compartments.

Portable fire extinguishers shall be mounted in such a way that they will not come adrift during operation of the boat, and can be readily demounted for use when required.

6.2 FIXED FIRE EXTINGUISHING SYSTEM

6.2.1 General

A fixed fire extinguishing system complying with a recognised national or international standard should be provided in engine compartments located below decks. It is recommended that consideration be given to installing a similar system in fuel tank compartments, bilges and galleys.

6.2.2 Activation

The fixed fire extinguishing system may be manually or manually/automatically operated. The manual control for an engine compartment system should preferably be located adjacent to the helmsman's station. When in the manual mode the fire detection system should be arranged to activate an audible alarm rather than activate the fire extinguishing system. The system may then be activated by manual control if warranted. This arrangement is intended to avoid accidental activation of the fire extinguishing system.

6.2.3 Test facility

The fixed fire extinguishing system shall incorporate a test facility that can be operated without detonating the system.

6.3 INBOARD ENGINE COMPARTMENTS

On inboard boats where an automatic fire extinguishing system is not installed, provision shall be made so that a portable fire extinguisher can be discharged into the engine space while the engine cover remains closed.

SECTION 7 OWNERS MANUAL

7.1 GENERAL

Each boat shall be provided with an owners manual that adequately addresses the safety issues set out in Clause 7.2. The level of detail should be appropriate to the size of the boat and the level of equipment installed.

Additional material may be included in the owners manual. However, care should be taken to ensure that the key safety information set out in Clause 7.2 is prominently positioned and differentiated from less critical information.

Where the owners manual covers a range of boats, the information pertaining to the boat in question shall be clearly indicated.

7.2 CONTENTS

The owners manual shall address the following issues:

(a) The maximum recommended load includes the weight of all persons onboard, all provisions and personal effects, equipment, cargo (if any) and all consumable liquids (water, fuel, etc.). When loading the craft, never exceed the maximum recommended load. This may mean having fewer people on board than the recommended maximum person capacity. Always load the craft carefully and distribute loads appropriately to maintain design trim (approximately level).

(b) The maximum load and persons capacities determined in accordance with this Standard (AS 1799.1) and shown on the Australian Builders Plate for boats up to 6 m is based on use in moderate conditions in protected waters. The recommended maximum number of persons and the recommended maximum load should be reduced in conditions of increased risk, e.g. bad weather or when going offshore.

(c) A description of any special precautions that need to be observed prior to starting the engine or at other times to reduce the risk of explosion or fire.

(d) Advice that altering the boat's hull or permanent fittings, including the fitting of optional extras like foils, can affect the safety characteristics of the boat and expert advice should be taken before doing so.

(e) For boats that are unable to pass the test in Appendix F at full throttle, advice about the maximum safe manoeuvring speed.

(f) Advice about the effects on boat stability in windy conditions resulting from fitting biminis, canopies, 'clears' and other forms of weather protection.

(g) If the boat relies on air tanks to provide the required reserve buoyancy, information about the need to check the integrity of each tank periodically for loss of pressure tightness or ingress of water and a warning against drilling holes to secure fittings or otherwise compromising the integrity of the walls of the tank.

(h) For boats with enclosed spaces, the need to close up doors and hatches or insert storm boards during bad weather and at times of heightened risk.

(i) For trailer boats, advice related to towing including the towing mass and any special precautions to be taken.

(j) If applicable, information about strong points to be used in various situations, for example when accepting a tow on water and when towing another boat.

(k) Information about the maintenance of safety equipment supplied with the boat.

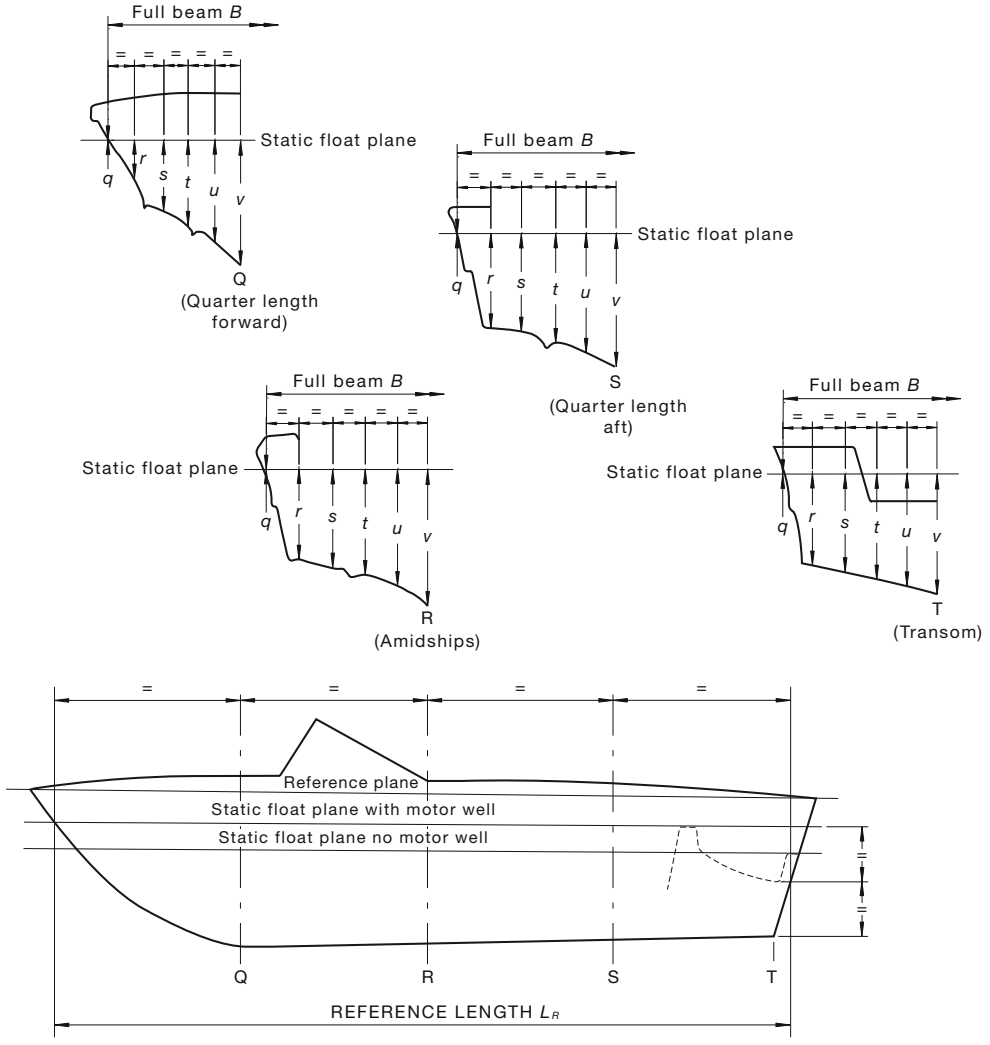
APPENDIX A

METHOD FOR CALCULATING MAXIMUM LOAD CAPACITY

(Informative)

A1 SCOPE

This Appendix sets out a method for calculating the maximum load capacity for a boat under 6 m in length, used in protected waters.



NOTES:

1 The reference plane passes through the intersections of the forward face of the stern, and the transom, with the sheer.

2 The static float plane passes through the point of major leakage (transform contour), and is parallel to the reference plane.

3 Transverse sections (Q, R, S and T) are established at the quarter lengths which, except for the transom, are perpendicular to the static float plane.

4 Vertical depths (*q, r, s, t, u* and *v*) are established below the static float plane in each transverse section at five equidistant intervals between the boat's longitudinal centreline and the extreme section width existing below the static float plane.

5 Measurements are taken to the outside of the hull (metres to two decimal places).

FIGURE A1 MEASUREMENT USED IN DETERMINING CUBIC CAPACITY OF HULL

A2 OUTBOARD INSTALLATIONS

The procedure is as follows:

(a) Determine the areas of sections in square metres (see Figure A1), using the following equation for each section:

$$A_{\mathrm{Q,R,S,T}} = \frac{B}{15}(q + 4r + 2s + 4t + 2u + 2v)$$

where

B, q, r, s, t, u and *v* are the relevant dimensions for each section as shown in Figure A1 and A_{Q}, A_{R}, A_{S} and A_{T} refer to the sections Q, R, S and T, respectively.

(b) Determine the cubic capacity of hull in cubic metres using the following equation:

$$V_{\mathrm{hull}} = \frac{L_{\mathrm{R}}}{12}(4A_{\mathrm{Q}} + 2A_{\mathrm{R}} + 4A_{\mathrm{S}} + A_{\mathrm{T}})$$

where

V_{hull} = hull volume, in cubic metres

L_{R} = reference length, in metres

NOTES:

1 The volume of integral structure aft of the transom below the static float line may be added to the calculated cubic capacity.

2 If the static float plane is above the transom motor cut-out, the volume (in cubic metres) within the motor well, which is below the lowest point of the motor cut-out, is subtracted.

(c) Determine the maximum load capacity in kilograms (nearest whole number), using the following equation:

$$M_{\mathrm{C}} = \frac{(V_{\mathrm{hull}} \times 1000) - M_{\mathrm{B}}}{5}$$

where

V_{hull} = hull volume, in cubic metres

M_{C} = maximum load capacity, in kilograms

M_{B} = mass of boat (including installed fuel tanks and fuel, but excluding engine, controls and portable fuel tanks), in kilograms

A3 INBOARD INSTALLATIONS

The procedure is as follows:

(a) Determine the areas of sections in square metres (see Figure A1), using the following equation for each section:

$$A_{\mathrm{Q,R,S,T}} = \frac{B}{15}(q + 4r + 2s + 4t + 2u + 2v)$$

where

B, q, r, s, t, u and *v* are the relevant dimensions for each section as shown in Figure A1 and A_{Q}, A_{R}, A_{S} and A_{T} refer to the sections Q, R, S and T, respectively.

(b) Determine the cubic capacity of hull in cubic metres using the following equation:

$$V_{\text{hull}} = \frac{L_{\text{R}}}{12}(4A_{\text{Q}} + 2A_{\text{R}} + 4A_{\text{S}} + A_{\text{T}})$$

where

V_{hull} = hull volume, in cubic metres

L_{R} = reference length, in metres

NOTE: The volume of integral structure aft of the transom below the static float line may be added to the calculated cubic capacity.

(c) Determine the gross load capacity, in kilograms, using the following equation:

$$M_{\text{G}} = \frac{(V_{\text{hull}} \times 1000) - M_{\text{B}}}{5}$$

where

V_{hull} = hull volume, in cubic metres

M_{G} = gross load capacity, in kilograms

M_{B} = mass of boat (excluding engine, installed fuel tanks and fuel)

(d) Determine the maximum load capacity in kilograms (nearest whole number) using the following equation:

$$M_{\text{C}} = M_{\text{G}} - M_{\text{E}}$$

where

M_{C} = hull volume, in cubic metres

M_{G} = gross load capacity, in kilograms

M_{E} = mass of engine, installed fuel tanks and fuel

APPENDIX B

METHOD FOR DETERMINATION OF REQUIRED VOLUME OF FLOTATION MATERIAL

(Informative)

B1 SCOPE

This Appendix sets out a method for estimating the amount of flotation material that has to be fitted in boats up to and including 6 m in length to achieve basic or level flotation.

B2 PRINCIPLE

The equations and methods of calculation set out in this Appendix provide a guide to the minimum volume and appropriate distribution of flotation material required to maintain a basic or level flotation in a swamped boat in the condition of maximum load and persons capacity, when fitted with the largest motor for which the boat is rated, and with all equipment in its normal position.

Level flotation needs to be verified by a test in accordance with Appendix C.

B3 DETERMINATION OF FLOTATION MATERIAL REQUIRED FOR BASIC SWAMPED FLOTATION

The procedure is as follows:

(a) Determine the submerged weight of the boat (M_S) in kilograms (nearest whole number) using the following equation:

$$M_s = M_h k_1 + M_d k_2 + M_t + 0.69\ M_e$$

where

M_h = dry mass of hull, in kilograms

M_d = dry mass of deck, in kilograms

M_t = dry mass of superstructure, in kilograms

M_e = dry mass of factory installed equipment, hardware and accessories, in kilograms

k_1 , k_2 = conversion factors for materials used from Table B1

NOTE: The equation for determining M_s may be amplified for greater accuracy by considering more of the different materials used in the construction of a boat. The mass of part s made of each material should be determined and multiplied by the conversion factor for the material. The basic equation given above for M_s will yield an approximate submerged mass accurate enough in most cases for use in determining the amount of flotation material needed.

(b) Determine the submerged weight of the engine and related equipment (G), in kilograms (to the nearest whole number), as follows:

(i) *Outboard installations* Determine the maximum power capacity of the boat (see Clause 2.4.1) and obtain from Column 6 of Table 2.1 the submerged weight of the largest engine, portable fuel tanks and related equipment for which the boat is rated.

(ii) *Inboard installations* Determine the installed mass in kilograms (nearest whole number) of the engine, associated equipment, fuel tanks and fuel, then multiply the result by 0.75.

(c) Determine the maximum load capacity (M_C) in kilograms (nearest whole number), as detailed in Clause 2.1

NOTE: Appendix A provides a suitable method of calculation.

(d) Determine the total weight (M_T) in kilograms (to the nearest whole number) that has to be supported using the following equation:

$$M_T = M_S + G + 0.1\ M_C$$

(e) For closed cell plastic flotation materials, determine the volume in cubic metres of flotation material required for basic flotation (F) using the following equation:

$$F = \frac{1.2M}{D}$$

where

D = (1000 – density of flotation material to be used) in kilograms per cubic metre

NOTE: The 1.2 factor takes account of both the potential loss of buoyancy of the material and provides a margin to ensure the swamped boat has positive buoyancy.

(f) If air chambers are used, determine the volume in cubic metres of the flotation chambers required for basic flotation (F) using the following equation:

$$F = \frac{1.1M}{D}$$

where

D = 1000 kg/m^3 (the mass of 1 m^3 of fresh water)

NOTE: The volume calculated is for the remaining air chambers after the two largest air chambers have been discounted.

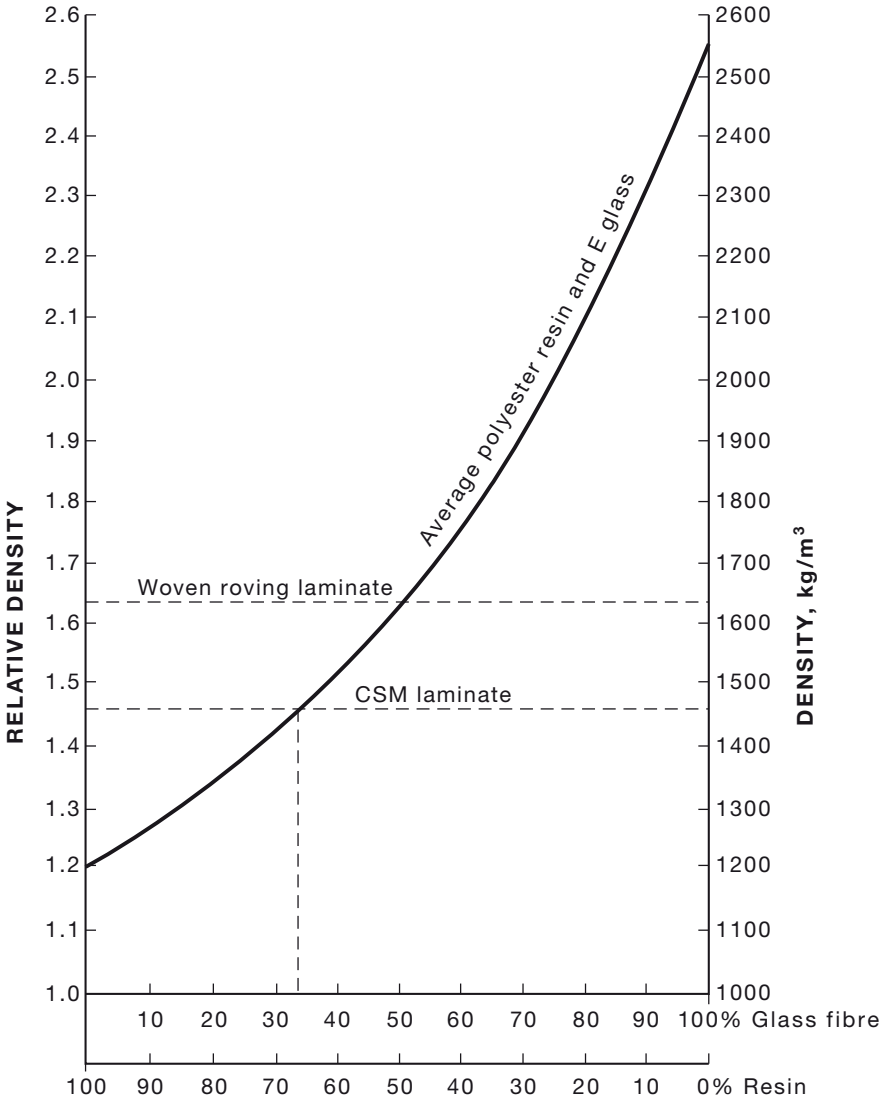


FIGURE B1 DENSITY RANGE OF LAMINATES COMPOSED OF VARIOUS PERCENTAGES OF RESIN AND GLASS FIBRE

B4 GUIDE TO THE VOLUME AND PLACEMENT OF FLOTATION MATERIAL REQUIRED FOR LEVEL SWAMPED FLOTATION

B4.1 Location of flotation material

Paragraph B4.2 provides guidance on the amount and distribution of flotation material to be fitted in order to achieve level flotation when swamped. This is only a guide and whatever calculation method is used, the actual in-water performance is subject to the requirements of Appendix C.

Boats provided with flotation material in accordance with Paragraph 4.2 will float at about the sheer line. A substantial proportion of the flotation material should be located along the boat's sides, above the loaded swamped waterline.

To effect the required distribution of flotation, it may be necessary to relocate flotation material from the keel area. It is recommended that this keel area be open fore and aft for ventilation, and so that the area can quickly flood from either end to provide some counterbalance when swamped.

The volume of flotation material determined in Steps (b), (c) and (d) may overlap and may not total the same as that in Step 1.

TABLE B1

RELATIVE DENSITY, DENSITY AND FACTOR *k* FOR SOME MATERIALS USED IN BOAT BUILDING

Material	Relative density	Density kg/m^3	Factor (k_1, k_2, etc.)
Aluminium	2.55 to 2.80	2 550 to 2 800	+0.62
Balsawood	0.06 to 0.39	60 to 390	−14 to −1.6
Brass (cast)	8.40 to 8.70	8 400 to 8 700	+0.88
Cast iron	7.03 to 7.13	7 030 to 7 130	+0.86
Concrete (1:2:4)	2.20 to 2.40	2 200 to 2 400	+0.57
Copper	8.88 to 8.95	8 800 to 8 950	+0.89
Fresh water	0.998	998	—
Glass (common)	2.40 to 2.80	2 400 to 2 800	+0.62
Glass fibre (no resin)	2.58	2 580	+0.61
Huon pine	0.64	640	−0.50
Jarrah	0.88	880	−0.14
Kauri (Queensland)	0.57	570	−0.73
Lead	11.34	11 340	+0.91
Meranti	0.45	450	−0.22
Monel metal	8.97	8970	+0.89
Moulded plywood	0.61	610	−0.63
Mountain ash	0.80	800	−0.20
Oregon	0.64	640	−0.50
Pacific maple	0.51	510	−0.94
Perspex	1.18	1 180	+0.16
Phosphor bronze	8.88	8 880	+0.89
Plywood	0.57	570	−0.73
Polyester resin (no glass)	1.20 (av.)	1 200 (av.)	+0.17 (av.)
PVC (flexible)	1.30	1 300	+0.23
Queensland maple	0.72	720	−0.38
Sea water	1.02 to 1.03	1 020 to 1 030	—
Spotted gum	0.96	960	0.00
Steel	7.80	7 800	+0.87

NOTES:

1 For Glass Fibre Laminates see Figure B1.

2 For materials not listed, the following equation for *k* should be used:

$$k = \frac{\text{density of material} - \text{density of freshwater}}{\text{density of material}}$$

B4.2 Method of calculation

(a) Determine total volume of flotation material (F) in cubic metres required to support the swamped boat, using Steps (a) to (e) of Paragraph B3, except that in Step (d) use $0.25\ M_C$ instead of $0.1\ M_C$ to provide for the support of persons in the boat (see Figure B2).

(b) Determine amount of flotation material (F_S) in cubic metres (to three decimal places) required to be distributed around the hull sides as close to the gunwale as possible to support the partially submerged persons mass in the boat, using the following equation:

$$F_S = \frac{0.25 M_C}{D}$$

(c) Determine amount of flotation material (F_a) in cubic metres required to be placed in the 30% aft section of the boat to support the motor mass, using the following equation:

$$F_a = 0.5\ F$$

(d) Determine amount of flotation material (F_f) in cubic metres required to be placed in the forward 30% of the passenger carrying area, using the following equation:

$$F_f = 0.25\ F$$

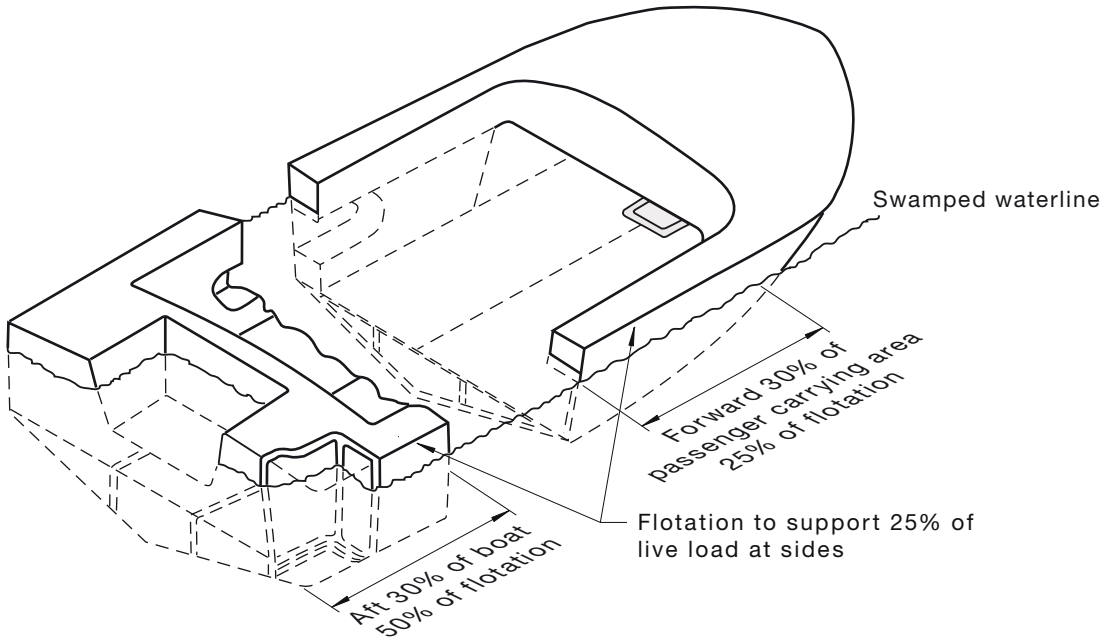


FIGURE B2 PLACEMENT OF FLOTATION MATERIALS TO ACHIEVE LEVEL FLOTATION

APPENDIX C

ASSESSMENT OF LEVEL FLOTATION

(Normative)

C1 SCOPE

This Appendix sets out a method for assessing the swamped flotation performance of boats up to and including 6 m in length to determine whether they achieve level flotation with swamped stability.

C2 PRECONDITIONING

Prepare the boat as follows:

(a) In accordance with Clause 2.5.6, vent the two largest air compartments at their high and low points, if air compartment buoyancy is used.

(b) Vent any other fully or partially enclosed spaces that may entrap air.

(c) Vent seats, cushions and upholstery items.

(d) Fill all installed fuel tanks with fuel and seal openings.

(e) Fill water and holding tanks with water.

(f) Flood any wells, including bait wells, storage boxes, ice boxes or similar.

(g) For outboard installations, attach weights to simulate the swamped weight of the largest outboard motor for which the boat is rated, including the weight of controls and batteries, obtained from Column 7 of Table 2.1.

(h) For each person up to the maximum persons capacity, provide a 20 kg steel weight to simulate the person's partially submerged weight.

(i) Provide steel weights to simulate the weight of ancillary equipment and personal gear.

The dry mass of the steel weights is W, calculated as follows:

$$W = M_C - (M_O + 80\ C)$$

where

W = dry mass of steel weights, in kg

M_C = maximum load capacity, in kg

M_O = for outboard installations, mass of outboard motor and controls, in kg, from Column 2 of Table 2.1

C = maximum persons capacity, expressed as a whole number

(j) Swamp the boat for 15 minutes or until all the entrapped air mentioned in Items (e) and (f) has fully escaped, whichever is the longer.

C3 TESTS AND ASSESSMENT

C3.1 Symmetrical fully-laden angle of heel test

The procedure shall be as follows:

(a) Distribute the 20 kg passenger weights symmetrically in the passenger carrying area of the boat to simulate the typical distribution of persons. Locate the ancillary equipment and personal gear weights of mass *W* centrally in the passenger carrying area of the boat.

(b) Place the swamped boat in an equilibrium position in calm water. Release the boat and observe it for 5 minutes.

(c) Observe whether the boat heels at an angle greater than 10° from the vertical. If less than or equal to 10°, the boat passes this aspect of the test.

(d) Locate the forward and aft reference areas 600 mm from the boat's stem and stern, respectively (see Figure C1 and Clause 1.3).

(e) Observe whether at least one location on either the forward or aft reference area (see Figure C1) remains above the surface of the water. If so, the boat passes this aspect of the test.

(f) Identify the highest point in each immersed reference area and determine whether that point is less than 150 mm below the surface of the water (see Figure C2). If less than 150 mm, the boat passes this aspect of the test.

(g) Report whether the boat passed the three aspects of the test.

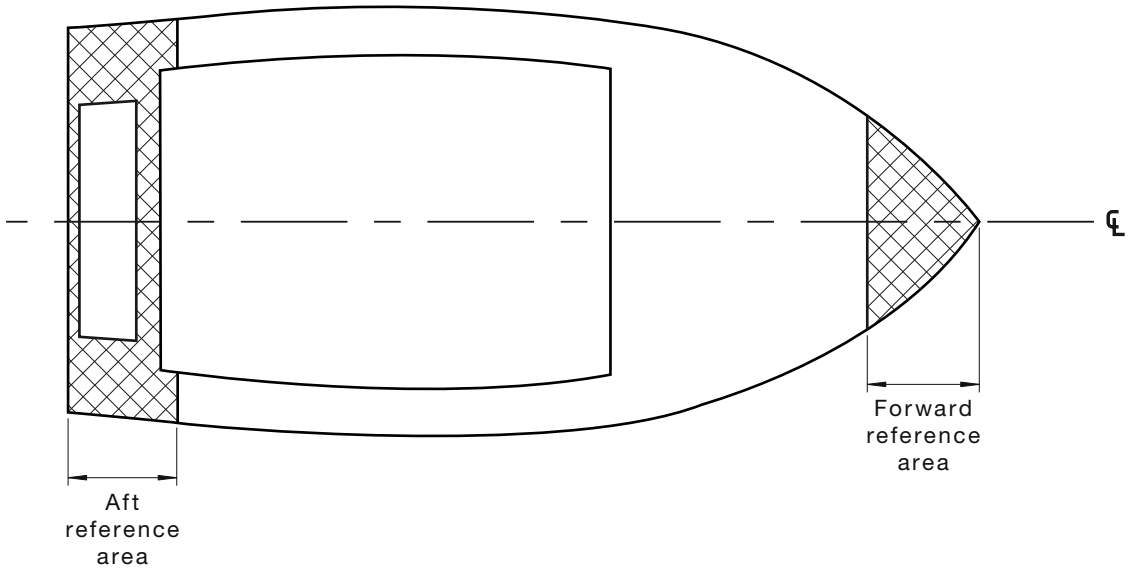


FIGURE C1 REFERENCE AREAS

C3.2 Asymmetrical partially-laden angle of heel test

The procedure shall be as follows:

(a) Distribute half the 20 kg passenger weights to one side of the passenger carrying area of the boat in accordance with the 'persons to one side' column of Table 5.1. Remove the remainder of the passenger weights from the boat.

(b) Locate the ancillary equipment and personal gear weights of mass *W* centrally in the passenger carrying area of the boat.

(c) Place the swamped boat in an equilibrium position in calm water. Release the boat and observe it for 5 minutes.

(d) Observe whether the boat heels at an angle greater than 30° from the vertical. If less than or equal to 30°, the boat passes this aspect of the test.

(e) Observe whether at least one location on either the forward or aft reference area remains above the surface of the water. If so, the boat passes this aspect of the test.

(f) Identify the highest point in each immersed reference area and determine whether that point is less than 300 mm below the surface of the water (see Figure C2). If less than 300 mm, the boat passes this aspect of the test.

(g) Report whether the boat passed the three aspects of the test.

C3.3 Unladen angle of heel test

The procedure shall be as follows:

(a) Remove the passenger and ancillary equipment weights from the boat, but not the weights simulating the outboard motor, batteries and controls.

(b) Place the swamped boat in an equilibrium position in calm water. Release the boat and observe it for 5 minutes.

(c) Observe whether the boat heels at an angle greater than 10° from the vertical. If less than or equal to 10°, the boat passes this aspect of the test.

(d) Observe whether at least one location on either the forward or aft reference area remains above the surface of the water. If so, the boat passes this aspect of the test.

(e) Identify the highest point in each immersed reference area and determine whether that point is less than 150 mm below the surface of the water (see Figure C2). If less than 150 mm, the boat passes this aspect of the test.

(f) Report whether the boat passed the three aspects of the test.

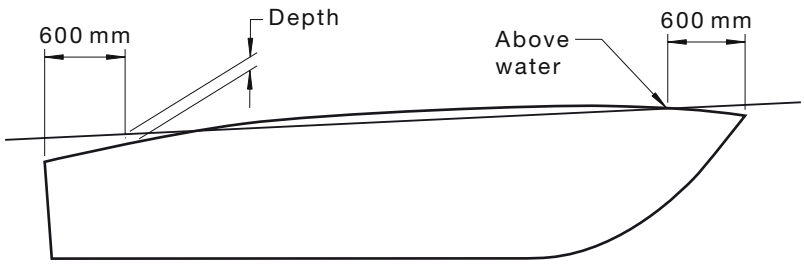


FIGURE C2 DEPTH OF REFERENCE AREA

APPENDIX D

BILGE PUMPING

(Normative)

D1 SCOPE

This Appendix sets out minimum requirements for bilge pumping arrangements where boats are required to be fitted with such arrangements.

D2 WATERTIGHT COMPARTMENTS

A watertight compartment having a volume of not more than 7% of the total underdeck volume may be drained into an adjacent compartment by means of a self-closing valve or cock. The valve or cock, where fitted, shall be located outside the compartment to be drained and shall be readily accessible.

Pumping shall be provided for all other watertight compartments.

D3 CAPACITY OF PUMP

Vessels shall be provided with manual or power bilge pumps of capacity not less than that specified in Table D1.

TABLE D1

BILGE PUMP CAPACITY

Boat length m	Installed discharge capacity kL/h
≤10	4.0
>10 ≤12.5	5.5
>12.5 ≤15.0	8.0

D4 PUMP DETAILS

Pumps shall comply with the following:

(a) A power pump may be driven by a main engine, an auxiliary engine, or by an electric motor. Where two power pumps are fitted, they shall not be dependent on the same source of power.

(b) A bilge pump shall be of the self-priming type or be provided with a suitable priming device.

D5 PIPING

D5.1 Material

Piping used in bilge-pumping systems shall comply with the following requirements.

(a) Piping used in vessels that are not subdivided into watertight compartments shall be of heavy gauge copper, steel protected against corrosion, stainless steel, salt water resistant aluminium, heavy wall PVC, or heavy duty reinforced synthetic rubber. Where synthetic rubber piping is used, it shall have a high resistance to heat, sea water, fuel oil, and vibration. It shall also be capable of operating under suction without collapsing.

(b) Piping used in vessels that are subdivided into watertight compartments shall be of copper, steel protected against corrosion, stainless steel, or salt water resistant aluminium.

D5.2 Pipe diameter

Bilge pipe diameter shall be not less than that specified in Table D2.

TABLE D2

DIAMETERS FOR PIPING

Boat length m	Internal diameter of pipe mm
≤10	25
>10 ≤12.5	32
>12.5 ≤15.0	38

D5.3 Pipe joints

Joints may be screwed, flanged or made by means of a reinforced synthetic rubber muff coupling. The rubber muff, where fitted, shall be secured to the pipe ends by a stainless steel clamp.

D5.4 Tail pipes

Flexible tail pipes may be used on the end of each bilge pipe. The material of the tail pipe shall have a high resistance to heat, vibration, sea water, and fuel oil.

D5.5 Strainers

Strainers shall be fitted on the end of each bilge line or a common strainer may be fitted on the suction side of the bilge valve chest. The holes in the strainer shall be not greater than 10 mm in diameter and the aggregate area of the holes shall be not less than twice the area of the suction pipe given in Table D2.

D5.6 Back-flooding

Bilge piping shall be arranged so as to prevent water passing from the sea into holds or machinery spaces. The bilge connection to any pump that draws from the sea shall be either a screw-down non-return valve, or a cock that cannot be opened to the bilges and the sea at the same time.

D6 BILGE LEVEL ALARMS

A bilge level device connected to an audible alarm or visible alarm should be fitted in all boats where the propelling machinery is below deck level and not visible from the steering position. With the machinery operating under full power conditions, the alarm shall, when operated, be clearly audible or visible at the steering position.

APPENDIX E

TESTS FOR WEATHERTIGHTNESS AND WATERTIGHTNESS

(Normative)

E1 WEATHERTIGHTNESS

A spray of water shall be applied once to the exterior joints, using a pressure of 100 kPa, and a discharge rate of 10 L/min. The spray nozzle shall be held at a distance of 1.5 m from the joint, and shall be moved at about 0.1 m/s.

On completion of the test, the joint shall be considered to be weathertight if water has not entered the interior of the boat.

E2 WATERTIGHTNESS

A jet of water shall be applied once to the exterior joints from a nozzle 12.5 mm inside diameter at a pressure of 100 kPa. The nozzle shall be held at a distance of 1.5 m from the joint under test, and shall be moved at about 0.1 m/s.

On completion of the test, the joint shall be considered to be watertight if water has not entered the interior of the boat.

APPENDIX F

TEST FOR CONFIRMATION OF MAXIMUM POWER CAPACITY

(Normative)

F1 SCOPE

This Appendix sets out a method for confirming whether a power boat can manoeuvre safely using its maximum power capacity.

F2 TEST CONDITIONS

The boat shall be rigged with all pertinent equipment and tested with the largest motor for which it is rated (outboard), or which is to be installed by the manufacturer (sterndrive and inboard). Where the maximum rated power for outboard boats may reasonably be expected to be met with either single or twin engines, both installations shall be tested.

The optimum propeller and engine tilt angle (outboard and sterndrive) consistent with maximum top speed within acceptable cavitation limits should be used.

Boats fitted with permanently installed fuel tanks should have them half full. Outboard boats should be tested with the integral tank on each engine or the portable tank for each engine, whichever is applicable, filled to its maximum capacity.

The boat shall be tested with two persons on board.

The test shall be conducted in smooth water of depth greater than 2 m.

F3 TEST COURSE

The test shall be conducted using the avoidance line test course as shown in Figure F1.

For boats with $v_{max} \leq 30$ knots, the distance, d, from the avoidance line at which turns are initiated shall be 6L. For boats with $v_{max} > 30$ knots, the distance, d, from the avoidance line at which turns are initiated shall be 6 L plus two metres for each knot above 30 knots. (See Table F1.)

F4 PROCEDURE

The procedure shall be as follows:

(a) Operate the craft at full throttle, at v_{max} straight ahead on a course parallel with and within 5 m of marker line A–B.

NOTE: Preliminary familiarization test runs may be conducted at any throttle setting and speed.

(b) Turns shall be initiated when the bow of the boat reaches a point opposite marker B as established by the speed at which the boat is being tested.

(c) Execute turn without reducing the throttle setting, without crossing the avoidance line and assume a course parallel with the avoidance line. Complete six test runs, turning three times to port and three times to starboard.

(d) To pass the test, the craft shall undertake the six consecutive test runs in such a way that the operator experiences no loss of directional control or stability and no difficulties maintaining position at the helm.

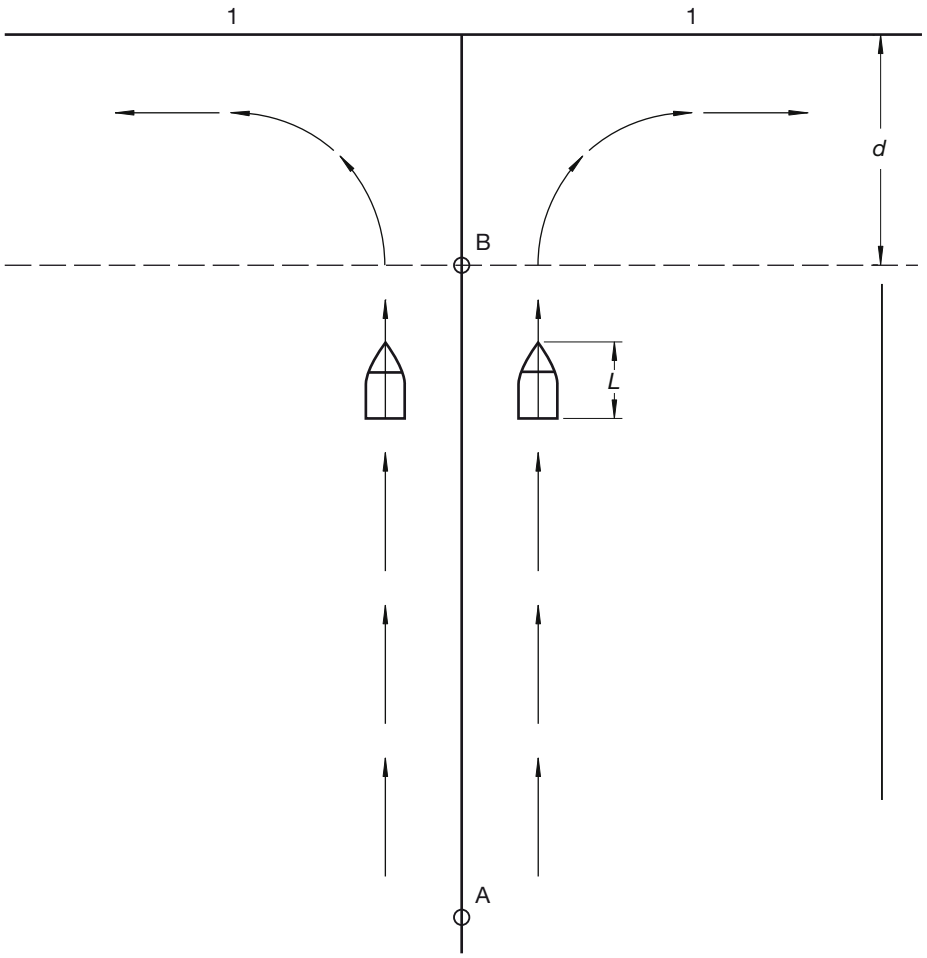


FIGURE F1 MANOEUVRING TEST

F5 EVALUATION

(a) If the maximum manoeuvring speed determined by test, i.e. not crossing the avoidance line while undertaking Steps (b) and (c) of Paragraph D4 for a given engine installation, is less than v_{max}, the craft manufacturer shall reduce the engine power installed for test, and nominated on the Australian Builders Plate (see Clause 1.4.1.1) as the maximum power rating, until the craft passes the manoeuvring test at v_{max}.

(b) For craft that can maintain directional control and stability while on a straight course at v_{max}, but are unable to meet the turning test requirements of Steps (b) and (c) of Paragraph F4, the turns required under Step (b) may be executed at a reduced speed with the distance from the avoidance line set in accordance with Paragraph F3 for that reduced speed. The craft may be rated for that maximum power provided—

A1

(i) the maximum manoeuvring speed at which the craft complies with the test requirements is not less than 85% of v_{max} ;

(ii) a speedometer is installed as standard equipment accurate to within ±5% of the maximum manoeuvring speed as determined above; and

(iii) advice regarding the maximum safe manoeuvring speed is provided in the Owners Manual.

TABLE F1
SUMMARY OF TEST REQUIREMENTS

Max. speed (v_{max}), knots	Test	Distance from avoidance line, d, m	If test failed
$v_{max} \leq 7\sqrt{L}$	no	–	–
$7\sqrt{L} < v_{max} \leq 30$	yes	$6L$	Reduce power rating, retest at v_{max}, or retest at >85% of v_{max} to pass, and install speedometer.
$v_{max} > 30$	yes	$6L + 2(v_{max} - 30)$	Reduce power rating, retest at v_{max}, or retest at >85% of v_{max} to pass, and install speedometer.

APPENDIX G

GUIDE TO THE SELECTION OF PORTABLE FIRE EXTINGUISHERS

(Informative)

G1 SCOPE

This Appendix gives guidance on the selection of portable fire extinguishers for small boats.

G2 CLASSIFICATION AND RATING OF FIRE EXTINGUISHERS

G2.1 General

Fire extinguishers complying with Australian Standards are marked with a classification and rating, determined in accordance with AS/NZS 1850, that indicates the class and size of fire for which they are suitable. An extinguisher should be selected for its suitability for use on the class of fire that is expected.

The numerical rating is an indication of the performance capacity of an extinguisher as determined by test (see AS/NZS 1850). The rating values range from 1 to 10 for Class A, 2 to 80 for Class B and 1 to 4 for Class F.

> CAUTION: THERE IS NO ONE TYPE OF FIRE EXTINGUISHER OR FIRE EXTINGUISHANT THAT IS EQUALLY SUITABLE AND DESIRABLE FOR USE ON ALL CLASSES OF FIRE.

G2.2 Class A fires

Class A fires are those involving carbonaceous solids. Extinguishers of the water type are preferred for Class A fires. Where they are appropriately classified, foam and powder type extinguishers may also be suitable.

G2.3 Class B fires

Class B fires are those where flammable liquid is involved. Suitable extinguishers for Class B fires include foam, powder and carbon dioxide.

G2.4 Class C fires

Class C fires are those involving flammable gases. There is no Australian Standard test for this classification and specialist advice should be sought.

G2.5 Class D fires

Class D fires are those involving combustible metals. There is no Australian Standard test for this classification and specialist advice should be sought.

G2.6 Electrical hazards

Where a fire including an electrical hazard can be expected, the extinguishant should be electrically non-conductive, in addition to having the relevant classification. The marking of ‘E’ on the fire extinguisher indicates that the extinguishant, as discharged, is electrically non-conductive.

G2.7 Class F fires

Class F fires are those involving cooking oils and fats. Suitable extinguishers for Class F fires include wet chemical and BE powders.

G3 TYPES OF PORTABLE FIRE EXTINGUISHERS

The following types of portable fire extinguishers are available:

(a) *Water type* Water type complying with AS 1841.2 are only recommended for fires in bedding, trim, upholstery etc. They are not recommended for electrical or fuel fires.

(b) *Wet chemical* Wet chemical type complying with AS 1841.3 are preferred for fires in vegetable and animal oils and fats. They are also able to extinguish Class A fires.

(c) *Foam type* Foam type complying with AS 1841.4 are suitable for Class B fires and may be used for Class A fires, but are unsuitable for fires involving energized electrical equipment and are of limited effectiveness on Class F fires. A special foam is required for alcohol fires.

(d) *Carbon dioxide type* Carbon dioxide type complying with AS 1841.6 are most suitable for Class B fires, more particularly in confined spaces. The cooling effect is small and re-ignition can occur. Carbon dioxide fire extinguishers are not available in ratings greater than 5B and are quite heavy to lift. Suitable for electrical fires.

(e) *Powder type* Powder type complying with AS 1841.5 are suitable for Class B fires and for flammable gas fires. ABE and other ‘super powders’ are most effective and can also be used on Class A fires, but have limited effectiveness on fires involving cooking oils and fats. While BE powder is not effective on Class A fires, it is effective on fires involving cooking oils and fats. Powder extinguishers are suitable for electrical fires.

(f) *Vaporizing liquid type* Vaporizing liquid type complying with AS 1841.7 are suitable for Class A and B fires and may be suitable for flammable gas fires, depending on the particular extinguishant. Care should be taken when using any vaporizing liquid extinguishers in confined spaces as the fumes can be hazardous. Some types will soften polyester resin if they are not hosed down. Suitable for electrical fires.

AMENDMENT CONTROL SHEET

AS 1799.1—2009

Amendment No. 1 (2010)

CORRECTION

SUMMARY: This Amendment applies to the Preface, Clauses 2.6.3, 5.2.3 and Appendix F.

Published on 19 May 2010.

Amendment No. 2 (2010)

CORRECTION

SUMMARY: This Amendment applies to Clause 3.5.2.

Published on 3 September 2010.

NOTES

NOTES

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