1.1 Glossary

a	
abeam	at right angles to the fore and aft line of the boat, but not on the boat.
adrift	loose, not on moorings or towline.
aft	the stern of the boat.
aid to navigation	a device designed to be used for navigation for the guidance of mariners.
amidships	the centre of the boat.
astern	behind the boat, opposite of ahead.
b	
bar	shallow area (which may be dangerous) formed by sand, mud, gravel or shingle near the mouth of a river or at the approach to a harbour.
beam	the greatest width of the boat.
Beaufort Scale	a scale used in reference to measurement of wind force.
bilge	the interior of the hull below the floor boards.
bow	the forward part of a boat.
bridge	the location from which a ship is steered and its speed controlled; 'control station' is really a more appropriate term for small boat.
bulkhead	a vertical partition separating compartments.
buoy	an anchored float used for marking a position on the water or a hazard or a shoal and for mooring.
buoyancy	the ability to float.
c	
capsize	to overturn a boat.
cast off	to let go.
chart datum	reference water level for soundings and drying heights on a chart and for tides.
chine	the intersection of the bottom and sides of a flat or v-bottomed boat.
current	the horizontal movement of water.
d	
displacement hull	a type of hull that ploughs through the water, displacing a weight of water equal to its own weight, even when more power is added.
draft	the depth of the boat below the waterline.
drogue	a cone-shaped parachute device to aid control by slowing ships down in heavy weather.
e	
ebb tide	a receding tidal flow.
EPIRB	emergency position indicating radio beacon.
f	
fairway	a navigable channel.
fathom	six feet.
flare	(a) the outward curve of a boat's sides near the bow; (b) a distress signal.
flood tide	an incoming tidal flow.
following sea	an overtaking sea travelling in the same direction of the boat.

fore-and-aft	in a line parallel to the keel.
fouled	any piece of equipment that is jammed or entangled, or dirtied.
freeboard	the minimum vertical distance from the surface of the water to the gunwale.
g	
give-way vessel	a term used to describe the ship which must yield in meeting, crossing, or overtaking situations.
ground tackle	a collective term for the anchor and its associated gear.
gunwale	the upper edge of a boat's sides.
h	
heading	the direction in which a ship's bow points at any given time.
headway	the forward motion of a boat; opposite of sternway.
heave-to	settling the boat into the wind with minimal headway.
helm	the wheel or tiller controlling the rudder.
hold	a compartment below deck in a large ship, used solely for carrying cargo.
hull	the main body of a ship.
hypothermia	a condition in which a person's body temperature is dangerously low due to exposure to severe cold.
i	
inboard	more toward the centre of a ship; inside; a motor fitted inside a boat.
isobar	line on a weather map joining places of equal air pressure.
k	
keel	the centreline of a boat running fore and aft; the backbone of a ship.
knot	a measure of speed equal to one nautical mile (1852 m) per hour.
knot	a fastening made by interweaving rope to form a stopper, to enclose or bind an object, to form a loop or a noose, to tie a small rope to an object, or to tie the ends of two small ropes together.
l	
latitude	the distance north or south of the equator measured and expressed in degrees.
leads	marks which in line indicate the centre of a navigable channel.
lee	the side sheltered from the wind.
lee shore	the shore onto which the wind blows but downwind of a boat.
leeward	the direction away from the wind; opposite of windward.
leeway	the sideways movement of the boat caused by wind.
log	a record of courses or operation; also, a device to measure speed.
longitude	the distance in degrees east or west of the meridian at Greenwich, England.
m	
making way	ship under way and moving through the water.
midship	approximately in the location equally distant from the bow and stern.
mooring	an arrangement for securing a boat to a mooring buoy or a pier.
n	
nautical mile	one minute of latitude—approximately 1852 m.
navigation rules	the regulations governing the movement of ships in relation to each other, generally called steering and sailing rules, or rules of the road.
neap tide	tide when there is the smallest rise and fall (range) of water levels.
p	
PFD	personal flotation device (buoyancy vest or life jacket).
piloting	navigation by use of visible references, the depth of the water and so forth.
planing	a boat is said to be planing when it is essentially moving over the top of the water rather than through the water.

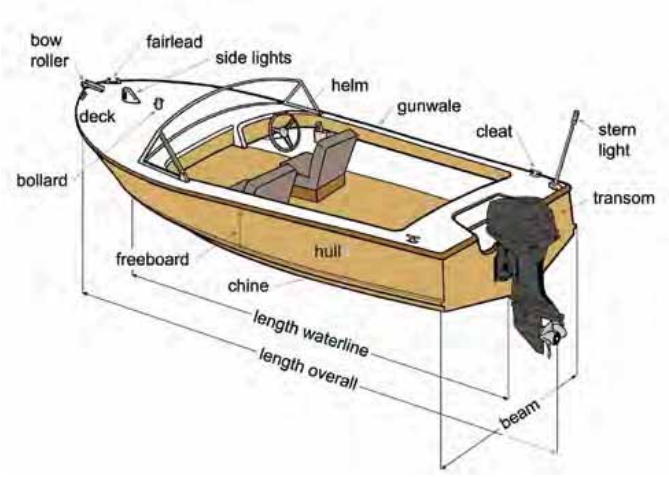
planing hull	a type of hull shaped to glide easily across the water at high speed.
port	the left side of a boat looking forward. A harbour.
PWC	personal watercraft.
q	
quarter	the sides of a boat aft of amidships.
r	
rode	the anchor line and/or chain.
rudder	a vertical plate or board for steering a boat.
running lights	lights required to be shown on boats under way between sunset and sunrise.
s	
satellite navigation	a form of position finding using radio transmissions from satellites with sophisticated on-board automatic equipment.
scope	technically, the ratio of length of anchor rode in use to the vertical distance from the bow of the ship to the bottom of the water.
screw	a boat's propeller.
scuppers	drain holes on deck, in the toe rail, or in bulwarks or (with drain pipes) in the deck itself.
sea room	a safe distance from the shore or other hazards.
seaworthy	a boat or a boat's gear able to meet the usual sea conditions.
set	direction toward which the current is flowing.
sounding	a measurement of the depth of water.
spring tide	tide when there is the largest rise and fall (range) of water levels.
squall	a sudden, violent wind often accompanied by rain.
stand-on vessel	that boat which has right-of-way during a meeting, crossing, or overtaking situation.
starboard	the right side of a boat when looking forward.
stern	the after part of the boat.
stow	to put an item in its proper place.
t	
tidal range	the difference in height of water between high and low tides.
tiller	a bar or handle for turning a boat's rudder or an outboard motor.
topsides	the sides of a ship between the waterline and the deck; sometimes referring to onto or above the deck.
transom	the stern cross-section of a square—sterned boat.
trim	fore and aft balance of a boat.
u	
underway	ship not moored, at anchor, or aground.
w	
wake (wash)	moving waves, track or path that a boat leaves behind it, when moving across the waters.
waterline	a line painted on a hull which shows the point to which a boat sinks when it is properly trimmed.
windward	toward the direction from which the wind is coming.
y	
yaw	to swing or steer off course, as when running with a quartering sea.

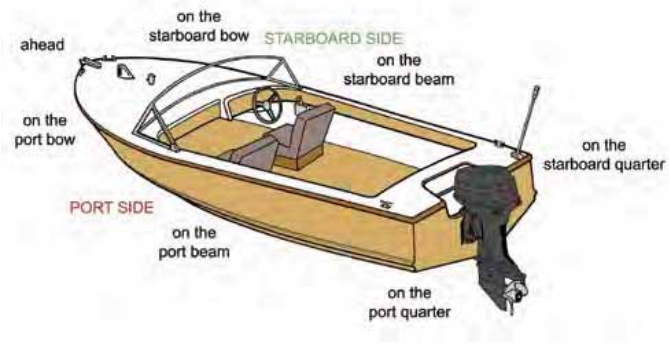
Material obtained from www.marinewaypoints.com

1.2 The language of boating

'Jargon' or specialised language has been developed over the years to refer to specific aspects of boating and provide clear and concise communication. You don't need to know all of the terminology, but a working knowledge will prove useful.

Basic parts of a boat

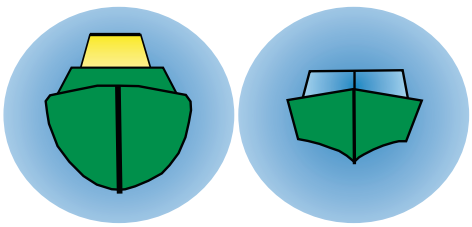




1.3 The hull

The design of a boat's hull determines how it will handle, how fast it will go, how steady it will be at sea. It will also influence load-carrying capability, fuel economy and engine requirements. Above all else, it will determine how safe the boat will be in varying conditions.

The two basic hull shapes are:



round bilge hard chine

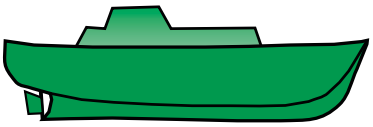
All boats displace some water when floating. The amount of water displaced by the boat is equal to the weight of the boat (including all items placed in it). The round bilge boat above would displace much more water than the light, shallow hard chine hull and sink more.

Displacement hull

These boats move through, not on, the water. They have good directional stability, have good stability in loading, and generally handle heavy weather well. Most displacement boats have inboard or inboard/outboard motors, and are usually kept on moorings. Characteristics include:

- deep, full-bodied hull
- good load-carrying capacity
- easily moved with modest power
- easy, comfortable motion.

Displacement speed can be reached with quite small engine power. Any increase in speed beyond this would require a massive increase in power and fuel consumption.

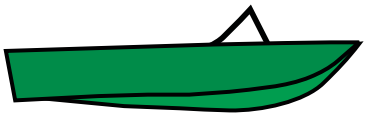


Planing hull

The powerful motor of a planing boat lifts the hull up and out of the displacement mode, well ahead of the bow wave, with only a small part of the flatter after-section of the hull in contact with the water. Characteristics include:

- light boats with less load-carrying capacity
- sufficient power
- hull shaped to provide lift
- most are hard-chined with a relatively flat section to the hull
- capable of much higher speeds than displacement boats.

All planing hulls are designed to go fast in smooth water. They can also plane in rough conditions, but speed may have to be reduced to below planing speed. The planing hull is also less efficient at slow speed, so care must be taken to maintain stability. This also means careful loading is critical.



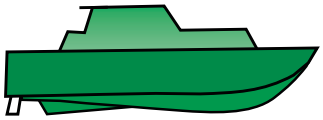
Off the plane

On the plane

Semi-displacement hull

This hull shape has a hard chine but a deep V forward reducing to a shallow V or nearly flat section aft. These boats require very large engines to achieve planing.

The deep V-section hulls cut through the water, giving a softer ride than boats with shallower hulls. They are primarily built for offshore performance as they ride well in a seaway and track well through waves. They require larger motors with corresponding increases in fuel costs.



Inflatables

Full inflatable or semi-rigid inflatable boats have great stability and give a soft though wet ride at speed, although in choppy water there is the risk of occupants being bounced out by an unexpected wave.

Inflatables are widely used in surf rescue work because of their low freeboard, soft sides and ease of launching. They are also popular as divers' workboats or yacht tenders.

They have their drawbacks–they have poor directional control and are susceptible to punctures as well as deterioration through ultra-violet (UV) radiation.

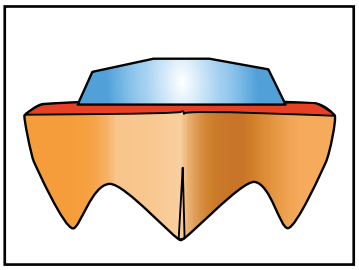
The development of rigid inflatable boats (RIBs) combining the benefits of the basic inflatable with those of a rigid hull has largely overcome these drawbacks.

Catamaran hull

The catamaran hull maintains the ride of a deep V hull and provides greater stability by spreading buoyancy over separated hulls. A cushion of air between the hulls at speed softens the ride but pounding of the bridge decking as the seas get up can negate this. The catamaran tends to turn flat, increasing the need for persons to hang on during turning.

Cathedral (tri) hull

This hull combines the advantages of the catamaran and deep V hulls. It is relatively stable, has a good ride and excellent turning. Being more complex to build, it tends to be a little more expensive.



1.4 Construction material

Boats are made from a variety of construction materials; each has its advantages and drawbacks. Consider factors such as weight, robustness, maintenance and appearance.

Glass-reinforced plastic (fibreglass)

Fibreglass hulls are strong and impact resistant. They need little maintenance if the surface gel coat is not damaged. If a fibreglass boat is kept permanently on a mooring, water can penetrate the layers of mat through chipped or rubbed patches, and an expensive case of osmosis can result. UV degradation can be a problem and the material can also be quickly abraded if dinghies are dragged across sandy beaches. Small patching jobs in fibreglass are straightforward, but major repairs are best left to professionals.

Aluminium

Aluminium is excellent boat-building material, especially for dinghies and workboats. 'Tinnies' outnumber all other small boats as they are versatile, light, fast, easy to handle, hard to damage even on rough landings, and need minimal maintenance. On the downside, they tend to be cold and noisy at sea. Electrolysis corrosion can be a problem if the boat is left in the water. Steel chain and anchors should not be left in permanent contact with the hull.

Rigid inflatables

Inflatable boats are now constructed of UV resistant PVC and are widely used as tenders or by rescue groups. They are often referred to as Inflatable Rubber Boats (IRBs).

Rigid hull inflatables have a fibreglass rigid or aluminium hull with an inflatable pontoon attached.

As small tenders, they have the advantage of being easily stowed aboard a larger boat, inflated or deflated. Inflatable dinghies are stable and can carry surprisingly big loads, although UV can break down the material and they can be easily chafed or cut. Care is needed when loading, beaching or coming alongside.

Steel

Steel is a relatively cheap and very strong method of building large hulls. Regular attention to paintwork is important to avoid corrosion. Corrosion by electrolysis can also be a major problem—cathodic protection should be built-in, and sacrificial zinc anodes used to capture stray electric currents that can quickly corrode metal in constant contact with salt water.

Ferro-cement

Steel-reinforced concrete is a cheap and effective method of building large hulls, although the plastering and curing process must be done with great care. It is strong and fire-safe, though harder to repair than other materials. Possible electrolysis of steelwork is a downside of this material, as is the difficulty in insuring boats of this construction.

Timber

Wood is a traditional and well proven boat-building material. Wooden hulls are quieter and warmer than hulls of other materials, although they are susceptible to rot and attack by marine pests such as borers and worms. The finishing paintwork is critical—whether built with solid timber planking or marine ply sheeting, wooden boats must be properly protected.

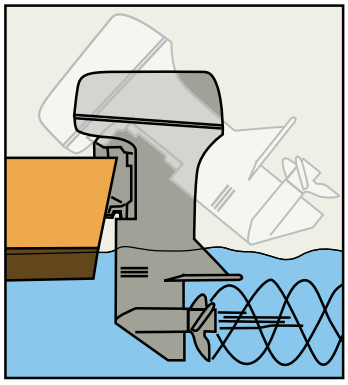
1.5 Propulsion

Each boat, depending on its design and intended use, will require different types of propulsion.

Most recreational boats use outboard engines and are less than 6 m in length. Larger keel boats and motor cruisers will have inboards or stern drive (inboard/outboard) motors.

Outboards

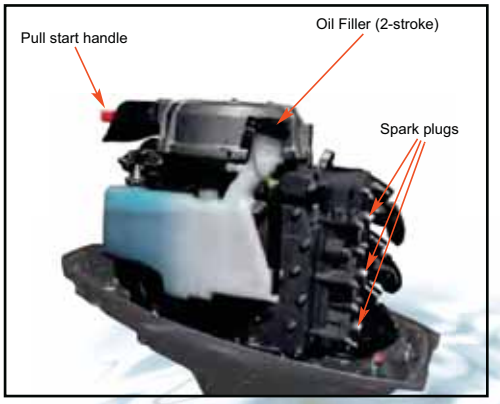
Outboard motors are ideal on smaller boats. They are light and powerful and modern outboards are extremely quiet.

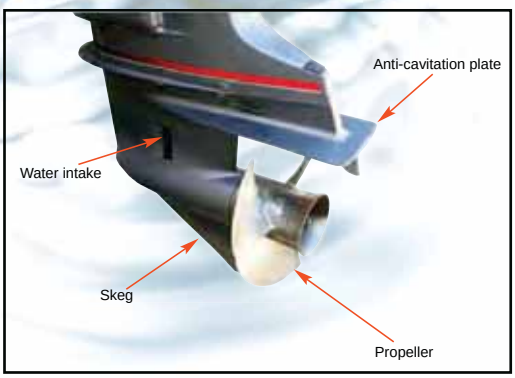


The outboard provides a completely self-contained propulsion system from engine to transmission to shaft and propeller. They are most often mounted directly on the transom of the boat. However, you may find boat designs incorporating a motor well or bracket on which the motor mounts. The entire motor swivels about to provide easy steering as the turning propeller pushes the stern.

Outboards come in a large range of sizes, numbers of cylinders and horsepower and can use different fuel types:

- small electric trolling motors
- petrol and oil mixture two-cycle engines
- petrol-only four-cycle engines
- diesel powered outboards
- fuel and oil injected two-cycle engines.



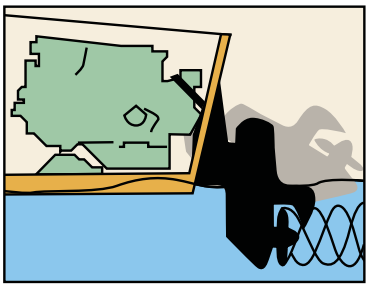


Outboards like to be used regularly—long periods sitting idle aren't good for them. If stored outside, use a cover and if left in the water for long periods of time, raise the leg of the motor as weed and coral growth can choke the water intake surprisingly quickly.

Above about 25 hp, outboards should be steered by wheel rather than tiller—the powerful torque of bigger motors makes tiller control dangerous.

A kill switch is an essential safety item—clipped to your wrist, jacket or belt, it cuts the motor if you are thrown away from the helm.

Stern drives (inboard/outboard)

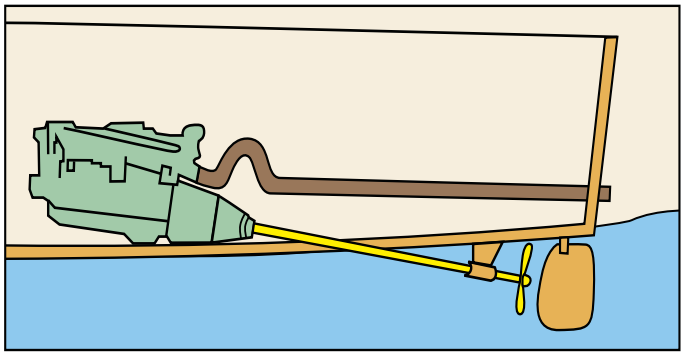


Stern drives are generally heavier than outboards. They consist of an engine mounted inboard and a drive unit attached low on the transom.

The stern drive steers as for an outboard and can generally be tilted up and down to provide boat trim while under way.

Stern drive motors come in petrol and diesel models and larger ones generally have more power than outboards. Because the main power supply is similar to a vehicle engine, easily accessible and more powerful, stern drives are often favoured over outboards on larger boats.

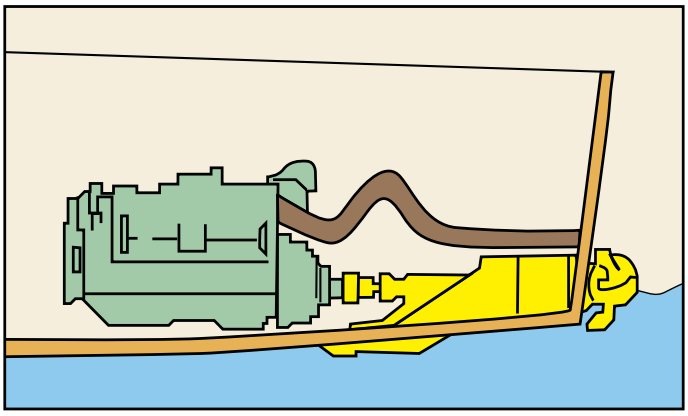
Inboards



On larger displacement boats, shaft-driven propellers and steering by rudder from tiller or wheel are the norm.

The engine, similar to the inboard/outboard, is mounted inside the boat toward the centre to give good weight distribution. Inboard engines may be marinised vehicle motors or purpose-built marine diesels. There are petrol inboard engines but by and large they are avoided. Compared to a diesel engine, they have a much higher risk of fire and explosion, are more affected by water in the electrics (rely on electric spark ignition rather than a diesel's compression ignition) and produce a more toxic gas exhaust.

Jet drives



These propulsion systems have the advantage of having no propeller to cause potential danger to people in the water and marine life. They are usually inboard engines that take in water that flows through a pump powered by an impeller. The water is then discharged at high pressure through a nozzle that propels the boat forward. The nozzle swivels to provide steering to the boat. Most personal watercraft use jet drives.

1.6 Batteries

On boats, batteries run all electrical systems like the engine starting, radios, lighting and navigational instuments.

The number of batteries on board depends on the power needed to operate the boat.

If you require two or more batteries in order to increase the amperage capacity, it is recommended you seek advice from a marine electrician.

Batteries should be removed periodically from a confined space for recharging with a portable charger.

1.7 Buoyancy

Many smaller boats are built with buoyancy and are said to have positive flotation (the manufacturer should supply documentation). This means the boat will stay afloat and upright when filled with water and will support the weight of passengers, equipment and the motor.

Inbuilt buoyancy is also possible in larger fibreglass boats and in most cases it must be requested before manufacture.

The benefits of buoyancy are:

- the boat will stay afloat when capsized or swamped
- it provides the opportunity to bail water out of the boat
- passengers can stay with the boat until help arrives
- the boat provides shelter and gives more time to activate emergency procedures.

Boats without positive flotation can sink within seconds—so quickly that a swamping can be life-threatening.

In smaller boats, generally speaking, flotation is having enough foam to compensate for the weight of the motor and to provide balance at the bow, under the seats or at the sides above the waterline.

There are different levels of flotation when a boat is filled with water:

Not enough or no flotation

The craft sinks quickly.

Basic flotation

This means the boat will float in some form if swamped. If the boat has capsized, it will remain afloat for you to possibly cling to the upturned hull.

Level flotation

This means that the boat will continue to float in a level position if swamped and will be prevented from capsizing in calm water. The buoyancy will allow you to remain in the boat and bail the vessel to remove the water. Additional flotation will prevent a boat from capsizing.

Note that all boats manufactured after July 1, 2006 are required to have some form of flotation, either level or basic.

Australian Builders Plate

All new recreational craft manufactured or imported into Queensland since September 2006 are required to show an Australian Builders Plate (ABP). The plate provides essential safety information about the use and limitations of the boat including the maximum number of people allowed on board, engine rating and weight and buoyancy performance (see below for full details shown on the Australian Builders Plate).

The presence of the Australian Builders Plate enables informed decisions on purchase and encourages appropriate use of boats.

The plate is to be permanently fixed and readily visible to the boat's operator in the cockpit or near the steering position.

1.8 Seaworthiness

It is the owner/master's responsibility to ensure the boat is in a seaworthy condition while being operated and adequate measures are taken to ensure the safety of the occupants. This is part of the general safety obligation.

Seaworthiness includes:

- the suitability of the boat and its propulsion for the type of activities and area of operations
- the physical condition of the boat itself
- proper loading with adequate freeboard
- carrying required and other necessary safety equipment
- operating within the limitations and capabilities of the skipper and crew
- complying with all regulations, including displaying correct navigation lights at night.

Information shown on the Australian Builders Plate

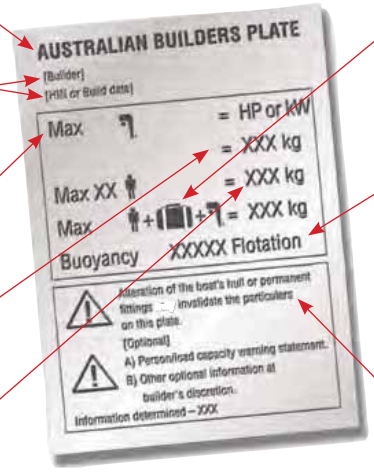
1 The plate's title, Australian Builders Plate.

2 The name of the boat's builder and either the Hull Identification Number (HIN) or the date built.

3 Maximum outboard engine power rating for which the boat has been designed and tested, expressed in kilowatts or horsepower.

4 Maximum outboard engine weight for which the boat has been designed and tested, expressed in kilograms.

5 Maximum number of persons on the boat, as recommended by the boat's builder, expressed in a whole number and in kilograms.



6 Maximum load for the boat, as recommended by the boat's builder, expressed in kilograms.

7 For boats less than 6 metres in length there will be a buoyancy statement. Up until 1 July 2006, the terms used may be either 'level flotation', 'basic flotation' or 'inadequate flotation'. After 1 July 2006, the term 'inadequate flotation' will no longer be allowed to be used.

8 A warning statement that if alterations make the boat different to the builderís specifications, the particulars on the Australia Builders Plate may be invalidated. The builder may also add other warning statements.

1.9 Registration

All boats fitted with a motor or auxiliary engine of 3 kW (4 hp) or more require registration when on the water in Queensland. Registration forms are available from and must be lodged with Department of Transport and Main Roads customer service centres.

The boat will be allocated registration symbols. These must be clearly visible in plain characters in a contrasting colour to the hull of the boat. The size of the characters depends on the type of boat:

- boats not capable of planing—minimum of 75 mm high on the sides or on the stern
- all other boats capable of planing for example speed boats and dinghies—minimum of 200 mm high on both sides

See page 86 for information on personal watercraft registration labels.

A label will be issued and must be placed on the exterior of the boat on the port side or stern adjacent to the registration symbols.

Tenders to registered recreational boats are exempt from registration provided they are used within two nautical miles of the mother boat. The tender must be marked with the word 'tender' and the mother boat registration numbers, at least 75 mm high, on the exterior of the tender, or if this is not possible, marked on the inside of the boat in the largest characters practicable. The tender may be marked with the owner's name, if it is used for more than one of the owner's boats.

When a registered boat is sold it is the responsibility of the new owner to lodge an application for transfer of the registration within 14 days.

Registration may be cancelled if the boat is no longer used in Queensland, is withdrawn from service, or no longer meets registration requirements.

Registration fees are calculated according to the boat length. Exemptions are given to totally and permanently incapacitated war pensioners and concessions apply to some pensioners and Senior Card holders for one boat.

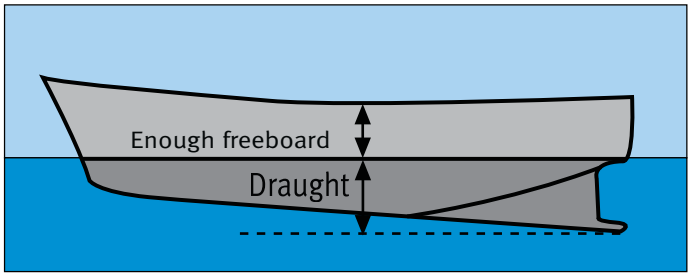
Recreational boats 15 metres and over

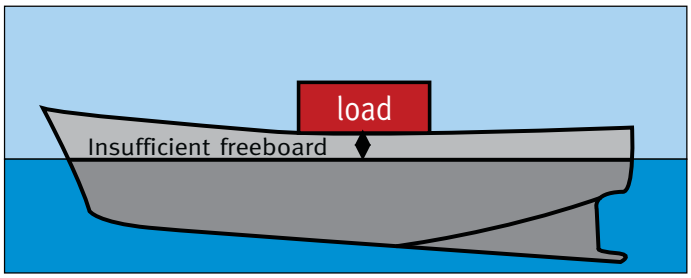
Applications for new registration, transfer of ownership or change of ship particulars for ships 15 metres and over must first be endorsed by Maritime Safety Queensland before they can be processed by a Department of Transport and Main Roads customer service centre. More information can be found on the Maritime Safety Queensland website.

1.10 Capacity specification

Capacity labels

Overloading is dangerous and one of the easiest ways to capsize your boat. The more weight in the boat, the lower the freeboard. Freeboard is the minimum vertical distance from the surface of the water to the gunwale. The gunwale is the upper edge of an open boat. Overloading compromises the safety of everyone on board and increases the chance of swamping or capsizing.





When preparing for a trip, the boat operator is responsible for assessing the load on board, both people and objects. Heavy items should be stowed in a low and central place where they cannot move around.

Weight, including passengers, should be distributed evenly through the boat. The weight of extra fuel and water should be taken into account.

By applying a capacity label you will have a constant reminder of how many people can be safely on board your boat in smooth waters and good conditions.

All registerable recreational boats, with the exception of sailing ships, must have one or more capacity labels attached. Capacity labels should be placed near the boat's control area/s where they can be seen by the operator at all times. A penalty could apply if a capacity label is not attached, unreadable or located in the wrong position on the boat.

The operator must keep in mind that the label indicates the number of people the boat can safely carry in good conditions and smooth waters. When using the boat in partially smooth or open waters or in rough conditions the operator should consider reducing the number of people taken on the trip. As a guide, reduce this number by one-third when boating on the open sea or in rougher conditions.

There are three different types of capacity labels available *(above):*

1. powered boats under 6 m
2. powered boats 6 m and over
3. powered boats with a flybridge.

Department of Transport and Main Roads customer service centres can provide a capacity label when registering or transferring the registration of a boat. Capacity labels are free.

Note: if the vessel has an Australian Builders Plate fitted where it can be seen clearly from the steering position, a capacity label is not required.

1.11 General safety obligation

All boat owners and operators are responsible for safety. The most important maritime safety principle is for operators to meet the 'general safety obligation' which encourages boat users to achieve the highest level of safety. Operators can achieve this obligation by ensuring their boat is:

- safe
- properly equipped and crewed
- operated in a safe manner.

Failure to meet this obligation can lead to prosecution and steep penalties. Some examples include:

Ensuring the boat is safe:

A boat is overloaded and swamped by a 'freak wave' and a passenger drowns. A court of law may find the operator negligent, declaring the boat was unsafe as it was unstable with so many people on board.

Ensuring the boat was properly equipped and crewed:

If passengers have never been on a boat before, it is the operator's responsibility to show them where the safety equipment is kept and how to put on a personal flotation device (PFD). If a boat sinks and someone drowns as a result of not knowing where the personal flotation devices are stored or how to put one on, the operator can be prosecuted.

Ensuring the boat is operated in a safe manner:

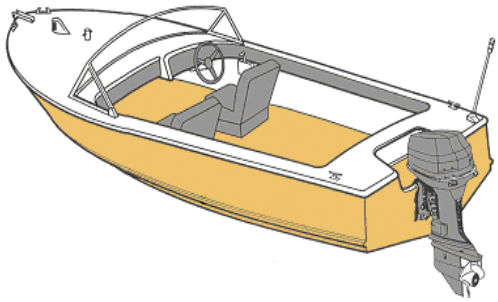
If a boat is lost for a period of time and it is shown the operator was unable to read a chart, plot compass bearings and use a compass, that person may be found to have operated unsafely.

Section 1 activities

Activity 1

Label the picture of this boat using the list of terms provided.

Bow
Stern
Chine
Keel
Transom
Helm
Deck
Port side
Starboard side



Activity 2

The two main kinds of boats are displacement and planing. In your own words what are the key differences between the two?

Displacement

Planing

Activity 3

The master of a boat is responsible for ensuring the boat is seaworthy for the voyage. Failure to do so puts lives at risk and may lead to a breach of your safety obligation. Write a list of conditions that, if met, will ensure a seaworthy boat.

Activity 4

What boats require registration?

Where are the registration numbers required to be displayed on a planing hull?

What is the minimum height for registration numbers on a planing hull?

Where can the registration numbers be displayed on a displacement hull?

What is the minimum height for registration numbers on a displacement hull?

Where must the registration label be displayed on the boat?

For a tender to be exempt from registration, what distance must the tender stay within the mother boat?

Tenders must have the correct markings. What are the markings they require?

How does the master of a boat determine the safe carrying capacity of the boat?

When boating outside of smooth waters what is the recommended reduction of capacity?

Explain the general safety obligation.