

National Marine Safety Committee

Guidance on safety related features of Recreational Boats for boat buyers, builders, designers and operators

June 2005

Recreational Boats.

Guidance on safety related features for boat buyers, builders, designers and operators.

The National Marine Safety Committee supports safe boating in Australia by providing resources to assist the Australian Maritime Industries Federation (AMIF) in judging the Boat of the Year awards. Mori Flapan has participated in three years of judging as the NMSC's representative. Over that time, he has had an opportunity to see both good and bad safety features of vessels. Rather than limit these observations to being recorded on judging sheets, the NMSC has decided that the interests of the industry would be best served by listing them anonymously in tabular form for reference of designers, builders and purchasers.

In looking at the list, it should be kept in mind that the design of a boat is a compromise between all the various relevant attributes: safety, performance, cost, comfort, utility, appearance, etc. Safety is not absolute, but is relative. A boat that does not have a particular safety feature listed as good below is not necessarily unsafe, but it is likely to be less safe than one that does have the feature. Whether the level of safety actually achieved is still acceptable depends upon other factors such as legislation, the arrangement of the boat, the competence of the operator, the area of operation, and so on.

Feature	Safety issues	Observations while judging boats
Grabrails	<p>Small boats, seagoing boats and boats that travel at speed need appropriately placed grabrails to prevent personal injury due to vessel motions, accelerations and decelerations. Grabrails should be located in places where persons are likely to congregate, visit or pass by.</p> <p>Grabrails need to be of robust construction and designed to feel comfortable and secure when held.</p>	<p>Good features:</p> <p>Boats with lots of grab rails located on cabin tops, open decks and in accommodation spaces.</p> <p>Grabrails incorporated in furniture also serve as fiddles (to contain loose items) or as decorative features.</p> <p>Grabrails under a coach-house roof or deckhead can provide an unobtrusive means of support over long distances.</p> <p>Poor features:</p> <p>Grabrails are sometimes omitted on boats for the sake of appearance or to reduce cost.</p> <p>Grabrails on some boats are uncomfortable to hold.</p>

Feature	Safety issues	Observations while judging boats
Guardrails	<p>In locations where persons normally occupy, guardrails (or bulwarks) are required around the perimeter of a decked vessel, at the ends of decks and in way of holes in decks.</p> <p>Guardrails should be a height not less than 600 mm to be effective. Greater heights are recommended where the risks of persons falling are large, e.g., the aft end of a flybridge.</p> <p>The fitting of intermediate courses at spacing not greater than 300 mm reduces the chance of an adult slipping and falling under the guardrail. Netting or closer spaces are needed to protect children.</p>	<p>Grabrails that are not of sufficient strength are dangerous.</p> <p>Good features:</p> <p>Guard rails that meet commercial vessel standards with three courses.</p> <p>Guardrails with a solid handrail on top rather than wire.</p> <p>Poor features:</p> <p>Some guardrails are reduced in height or omitted entirely for the sake of appearance.</p> <p>Some guardrails have only a single course with a large gap to the deck.</p>
Emergency escapes	<p>Emergency escapes provide an alternative route for escape from enclosed spaces. They are required where the distance to the main means of access is such that the path of escape may be blocked by smoke, fire in machinery or galley, floating debris, inflowing water, etc.</p> <p>Emergency escapes should be clear of obstructions on the outside, of sufficient dimensions to permit persons to pass through and arranged for reasonably easy access from within the space.</p> <p>Following the tragic death of children on a recreational vessel, emergency hatches are required in some States to be openable from both sides.</p>	<p>Good features:</p> <p>Emergency escapes in deckheads located over a berth or other furniture that will facilitate access through the opening.</p> <p>Poor features:</p> <p>Emergency hatches that are blocked from opening by tenders being stowed over them or spinnaker booms.</p> <p>Emergency hatches that are openable from the inside only (illegal in some States).</p>

Feature	Safety issues	Observations while judging boats
Non-slip surfaces	<p>Surfaces that are smooth, become slippery when wet, or are at large angles to the horizontal provide significant slipping hazards.</p> <p>Most boats have non-slip surfaces in walkways, on decks, etc.</p> <p>Monohull yachts need particular care because they operate at significant angles of heel.</p>	<p>Good features:</p> <p>Fore and aft battens on the cockpit deck of sailing vessels, especially where the width of the deck is too great to offer a foothold from the opposite side of the cockpit.</p> <p>Poor features:</p> <p>Rounded gunwales and other round edge structures are frequently identified as slip hazards.</p> <p>Some interior saloon deck floors can become very slippery when wet.</p> <p>Insufficient non-slip surfaces for persons on deck engaged in deploying or recovering the anchor.</p>
Means to recover persons	<p>Persons may enter the water intentionally or accidentally. Retrieval of persons from the water can be an awkward operation that places the person and others on the boat at risk.</p>	<p>Good features:</p> <p>Boats with boarding ladders.</p> <p>Boats with swim platforms.</p>
Securing of loose items on the vessel	<p>Small boats, boats that operate at speed and boats that operate at sea should have arrangements to secure loose items.</p>	<p>Poor features:</p> <p>A combustible folding portion of a benchtop that covered a galley range: it could not be secured and could fall back over the stove while the stove was in operation.</p> <p>Cabin doors without latches to hold them in the open position.</p> <p>Opening sections of the windscreen on bowriders and other small vessels that are hinged but do not have any method of securing in the open position.</p>
Seating	<p>The majority of recreational vessels should be provided with a seat for each person on board. This becomes even more important on smaller boats, boats that travel at speed or</p>	<p>Poor features:</p> <p>Boats without sufficient seats for the stated number of persons carrying capacity.</p>

Feature	Safety issues	Observations while judging boats
	<p>boats that operate to sea.</p> <p>Seats on boats that operate at speed should be arranged athwartships so that persons face either forward or aft. Seats that are arranged fore and aft, and particularly bench seats, do not provide a secure means of resisting accelerations.</p>	<p>Seats arranged fore and aft on boats that operate at high speed.</p> <p>Rear facing observer's seat on ski boats located too close to the windscreen, potential for head injury.</p> <p>Seats of insufficient strength or which are poorly secured and that could come adrift in normal or collision situations.</p>
Anchoring equipment	<p>Anchors are required by legislation in many jurisdictions.</p> <p>Anchors are used for everyday operations and also in emergency situations. If an anchor is not available or fails, the consequences can be tragic and expensive.</p> <p>Anchors should be of sufficient size. The anchor cable should be of sufficient length for the intended anchorages (typically five times the likely maximum depth of water) and should be provided with a length of chain or other means of weighting the cable. The other end of the anchor cable should be firmly secured to the boat to ensure that the cable cannot run out.</p> <p>Anchors should be provided with appropriate stowage, in a location ready for quick if not immediate use. The anchor locker should have a permanently open means for drainage otherwise deterioration of the anchor, cable and boat's structure can result.</p> <p>A reliable means for securing the anchor cable should be provided. The point of attachment should be located to limit the</p>	<p>Poor features:</p> <p>Some specialized vessels such as ski boats that have no proper provision for an anchor.</p> <p>Some small vessels have inadequate arrangements for anchoring, no bow roller, and anchor cleats well off the centerline of the boat.</p> <p>Anchoring arrangements that could, through their poor design, result in damage to adjacent fittings, hull and paintwork during use, deployment or retrieval.</p>

Feature	Safety issues	Observations while judging boats
	<p>tendency for the vessel to sway to and fro on the anchor.</p> <p>A bow roller facilitates ergonomic raising of the anchor and reduces chafe. The larger the vessel the heavier the anchor and cable. An anchor windlass should be provided on vessels where the weight of anchor and chain is more than 30 kg.</p>	
Freeboard	<p>Freeboard is the distance from the waterline to the weather deck (or gunwale on smaller boats). It is an important factor that affects many key safety characteristics of the boat including stability, buoyancy, propensity to nose-dive, wetness on deck, drainage of water on deck.</p> <p>Extremes of freeboard should be avoided.</p> <p>Too small a freeboard is one of the characteristics of a vessel that is overloaded, hence the load line on large ships. Low freeboard is associated with a low range of stability and a wet vessel.</p> <p>Too great a freeboard can indicate a vessel may be top-heavy and may be badly affected by wind.</p>	<p>Good features:</p> <p>Open and cockpit boats that have relatively large freeboard tend to be dryer and reduce the chance of swamping.</p> <p>Poor features:</p> <p>Some ski boats have very little bow height that suffices in smooth water but which is inadequate for choppy conditions. Operating instructions for some ski boats do not limit their use to smooth waters.</p> <p>Some vessels have a large freeboard to provide headroom in accommodation spaces. Excessive freeboard on smaller boats can reduce stability by increasing the vertical centre of gravity. It can also increase the heeling effect of wind on the lateral profile of the vessel.</p> <p>Excessively large cutouts for the outboard in the transom of boats without an outboard well. This can happen when an attempt is made to suit the vessel to a wide range of outboard makes and models.</p>
Weathertight integrity	<p>There are basically two types of boats: decked boats and open boats. An open boat is one in which water that gets onboard finds its way to the bilge (or a deck below the waterline) where it must be pumped</p>	<p>Good features:</p> <p>Decked boats are better suited for operations to sea.</p> <p>Poor features:</p> <p>Some manufacturers do not specify (in the operating manual or on</p>

Feature	Safety issues	Observations while judging boats
	<p>overboard. A decked boat is one where water that gets onboard drains relatively quickly overboard without being pumped.</p> <p>As a general rule, decked boats are more suited for open water use than open boats for a number of reasons. Firstly, water within an open boat can seriously reduce stability, freeboard and reserve buoyancy. Secondly, essential systems such as propulsion machinery and the bilge pump itself can be vulnerable to the rising water level within the open boat.</p> <p>The exception to the general rule is perhaps an open boat with level flotation (see below) that is arranged to keep essential systems operating when in the swamped condition (eg outboard, batteries, etc clear of the water in the swamped condition). But even so, large quantities of water on board effectively disable the boat until the water discharges.</p>	<p>the boat) the types of waters that the boat is suited for.</p> <p>Some decked boats have poor drainage of cockpits or wells. Water trapped on board can seriously reduce stability, freeboard and reserve buoyancy.</p>
Swamping and damage	<p>Boats can fill with water due to wave action, wind action, overloading, unsymmetrical loading, grounding, collision, failure of seawater systems, and other causes. Statistically, swamping and capsize is a significant cause of fatalities in dinghies, other open motorboats and half cabin motorboats (12% of fatal incidents involving these vessels, compared to 6% for other types).</p> <p>The fitting of fixed buoyancy in the form of foam or air chambers securely attached to</p>	<p>Good features:</p> <p>Small cockpits or wells that limit the amount of water that can be trapped on the boat, reducing the weight of water and it's free surface.</p> <p>Vessels that achieve the standard specified for level flotation. A boat with only basic flotation could be left floating at any attitude. In such situations, there is reduced chance of the boat's operational capability being recovered after the incident; necessitating rescue. Also persons are left in the water for the period of time it takes till rescue; and there may be little on the boat for those persons to cling to while waiting.</p>

Feature	Safety issues	Observations while judging boats
	<p>structure provides a margin of safety should large quantities of water find its way on board the boat. With the boat flooded, the quantity of fixed buoyancy should be sufficient to support the weight of the hull, machinery, equipment and fittings to prevent the boat from sinking.</p> <p>But there is more to the fitting of foam buoyancy than just this requirement. There are two definitions of flotation—</p> <p>Level flotation is 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. Basic flotation is 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. Level flotation provides the better safety because, for basic flotation, the boat could be upside down or with just the bow sticking out of the water.</p>	<p>Poor features</p> <p>Some open boats are provided with neither level nor basic flotation.</p> <p>Some boats do not clearly specify the type of flotation standard achieved. Such information is essential if consumers are to have an informed decision when purchasing and also for the purposes of contingency planning and response in the event of emergency.</p>
Type of fixed flotation	<p>The arrangements that provide fixed buoyancy must be reliable if they are to be of any use in an emergency.</p> <p>Buoyancy using fixed closed cell foam (that does not absorb water) is more reliable than buoyancy provided by air chambers. Hence standards for air chamber buoyancy require the system to work with any one and sometimes any two air chambers not</p>	<p>Good features:</p> <p>Buoyancy chambers fitted with valves for air inlet and pressure gauges to allow testing at time of manufacture and periodically.</p> <p>Vessels provided with polyurethane foam rather than polystyrene.</p> <p>Poor features:</p> <p>Warnings in the operating manual of vessels fitted with polystyrene foam stating that the vessel cannot be relied upon as a flotation device because the foam could be exposed to petrol in</p>

Feature	Safety issues	Observations while judging boats
	<p>functioning.</p> <p>Foam buoyancy materials vary in characteristics. The best types such as polyurethane are resistant to petrol or oil. Other foams such as polystyrene dissolve when exposed to petrol or oil. Such exposure may occur during normal operations such as fuel filling, or in emergency situations such as capsize.</p>	<p>the event of capsize.</p>
<p>Engine air intakes</p>	<p>Engine air intakes should be of a size sufficient to ensure the engine has sufficient air for proper fuel combustion. Insufficient air can reduce engine efficiency and maximum power output as well as increasing pollution levels.</p> <p>Engine air intakes are normally kept open when the vessel is operating. If too close to the waterline, they can become the first point of downflooding. Also, if poorly placed, they can result in excessive amounts of salt water laden air entering the engine which can cause damage.</p>	<p>Good features:</p> <p>Engine air intakes located as high as practicable on the vessel.</p> <p>Engine air intakes designed in the form of a dorade box that separates water and spray.</p> <p>Poor features:</p> <p>Some vessels have engine air intakes kept low on the hull for the sake of appearance.</p> <p>Some small engines have no dedicated air intakes, relying on gaps in panels, etc.</p> <p>Engine air intakes in locations prone to pick up engine exhaust fumes.</p>
<p>Engine exhausts</p>	<p>Engine exhausts carry toxic products of combustion out of the vessel. Leakage from an engine exhaust can be fatal. Also, if the engine exhaust is at or near waterline, a failure in the exhaust system can cause the boat to flood.</p>	<p>Good features:</p> <p>Exhausts made from corrosion resistant materials having as few joints as possible.</p> <p>Exhausts that discharge above waterline.</p> <p>Poor features:</p> <p>Exhausts located in inaccessible areas where inspection and maintenance is difficult.</p>

Feature	Safety issues	Observations while judging boats
Stability	<p>Stability is the ability of the vessel to float upright, and to return to upright after being exposed to a force that wants to tip it over, such as wind, waves, people moving to one side, water on deck, etc.</p> <p>Stability is determined by the physical characteristics of the hull as it immerses and by the distribution of weight on the vessel. As already indicated, freeboard has an important impact on stability as does weathertight integrity (see above).</p> <p>Stability when underway can also be a problem for vessels that travel at planning speeds.</p>	<p>Good features:</p> <p>Boats that meet established standards for stability.</p> <p>Catamarans have inherent advantages because of their relatively high initial stability (though these too can be eroded by poor design).</p> <p>Poor features:</p> <p>Boats that heel excessively when persons move to one side.</p> <p>Boats that heel excessively when exposed to the wind.</p> <p>Boats that heel excessively inboard or outboard when turning at speed.</p>
Hull construction	<p>There are numerous materials used for the construction of vessels. Each has advantages and disadvantages and no one material can be said to be the best for all applications.</p> <p>However, for each material, there are good designs and bad, ones that stand up to the rigours of service while not being overbuilt and others that are damaged too easily or are too heavy.</p> <p>Recognised construction standards provide a measure of confidence in the design of a vessel. They provide a benchmark against which a purchaser can measure the design of the vessel.</p>	<p>Good features:</p> <p>Boats designed and built to recognized recreational craft standards such as ISO, Classification society standards, AS1799, etc.</p> <p>Boats designed and built to commercial vessel standards such as the Uniform Shipping Laws Code or Classification society standards generally have a high level of robustness.</p> <p>Poor features:</p> <p>Hulls constructed of materials not suited to a salt water environment.</p> <p>Lack of continuity in structural components.</p>
Manufacturing standards	Better boat builders apply quality management principles to their	Good features:

Feature	Safety issues	Observations while judging boats
	<p>manufacturing processes to ensure customer needs are identified and fulfilled and to maintain quality in their products.</p> <p>The level of confidence grows where the builder's quality management system that has been independently audited or involves independent checking of production.</p>	<p>Builders independently accredited to ISO 9001, 9002 or some other appropriate quality management standard.</p> <p>Builders that involve independent parties such as classification societies, the NMMA (USA) or a Notified Body (EU) at key points in the manufacturing process.</p>
Construction details	<p>Certain areas of the hull construction are fundamental to the safety of the vessel. These include keel attachments on ballasted sailing yachts, engine bed framing and deck to hull joints</p>	<p>Good features:</p> <p>Keel bolt attachments on yachts that are corrosion resistant and arranged to properly distribute the loads into the hull bottom structure by using two widely spaced rows of bolts via floor stiffeners or bearer plates.</p>
Propulsion and steering redundancy	<p>The safety of vessels that operate at sea is severely compromised if the vessel has lost its means of propulsion or steering. The vessel's fate becomes subject to the vagaries of the wind, waves and current. Propulsive redundancy provides a highly effective means to reduce the risks of mechanical breakdown at sea.</p>	<p>Good features:</p> <p>Vessels with twin screw installations where the propulsion machinery is set up with dual fuel tanks, starting batteries, etc. Twin screws also provide an alternative means of steering.</p> <p>Vessels that carry sail as well as motor; e.g. auxiliary yachts.</p> <p>Vessels fitted with 'take home' motors of lesser power (e.g. auxiliary outboards, thrusters, etc).</p> <p>Poor features:</p> <p>Seagoing vessels with only a single starter battery.</p> <p>Seagoing vessels without emergency steering arrangements.</p>
Engine fuel type	<p>Diesel is inherently a safer fuel than petrol because of its higher flash point.</p> <p>All types of liquid fuel require special care to be handled safely. However, the demands for care become greater the lower the flash point</p>	<p>Good features:</p> <p>Vessels that are diesel powered.</p> <p>Poor features:</p> <p>Inboard petrol motors that are not provided with any one of the</p>

Feature	Safety issues	Observations while judging boats
	<p>of the fuel.</p> <p>Petrol fumes are heavier than air and can collect in the bilge of a boat creating an explosive mixture. All that is required is a spark from a starter motor, ignition system, battery installation or bilge pump and the mixture can ignite with disastrous consequences.</p> <p>An inboard petrol engine is inherently less forgiving than an outboard petrol engine. The inboard petrol engine has more chance of allowing fuel to leak below decks compared to an outboard with even a below deck fuel tank.</p> <p>Special measures can be provided to reduce the likelihood of petrol explosion including spark-proof electrical equipment, engine space blowers and fume detectors, however, each of these relies on proper ongoing maintenance and correct operational procedures.</p>	<p>following: spark-proof electrical equipment, engine space blowers, petrol fume detectors.</p> <p>Inboard petrol motors that have petrol fuel tanks in the immediate vicinity of the engine.</p>
Fuel fillers	<p>The location of fuel filling points can have a major impact on the safety of the vessel, particularly if the fuel is petrol.</p> <p>Fuel fillers should be located to ensure that any spillage cannot find its way down below or pool on deck. Fuel spillage should also be kept clear of any potential sources of ignition.</p> <p>Note: Environmental legislation prohibits the discharge of fuel overboard so larger vessels should have measures in place to prevent</p>	<p>Poor features:</p> <p>Petrol fuel fillers located on the gunwale immediately above electrical equipment.</p> <p>Petrol or diesel fuel fillers located on side decks or in cockpits where spillage will remain on deck or will travel large distances on deck before going overboard.</p> <p>Petrol fuel filler located on a fabricated gunwale where spillage can pass between unwelded laps into side and bilge voids, potentially creating an explosion risk and destroying polystyrene</p>

Feature	Safety issues	Observations while judging boats
	such incidents.	foam buoyancy contained within these spaces.
Machinery space fire extinguishing	<p>The machinery space is the location of highest fire risk on most recreational vessels. The confined nature of such spaces on relatively small vessels means that entry to fight a fire with portable extinguishers is not a viable option.</p> <p>The best protection of machinery spaces is provided by fixed fire extinguishing systems (FFE). Preparation prior to discharge is important to ensuring effective operation of these systems. The steps include evacuation of any persons, shutting down of machinery and fans and closing of air vents. A manually activated system is better because automatic discharge of FFE, though available, is unlikely to carry out such preparation automatically. Automatic discharge also effectively disables the vessel at what could be a time that is even more critical for other risks, taking control from the master.</p> <p>ISO standards specify FFE for all inboard petrol engines and diesel engines of more than 120 kW power.</p> <p>For small inboard engines, a portable fire extinguisher and discharge port provides another alternative. The discharge port allows the fire extinguisher to be discharged quickly and without having to open engine space covers. This greatly increases the effectiveness of the discharge and reduces the risks of the fire developing rapidly and</p>	<p>Good features:</p> <p>Remote arrangements to shut off fuel from fuel tanks.</p> <p>Machinery space fitted with a manually activated FFE and arrangements for pre discharge preparation including shutting down of machinery and fans and closing of vents.</p> <p>Small machinery space provided with a properly labeled discharge opening and an adjacent portable fire extinguisher of size sufficient to fully flood the space.</p> <p>Poor features:</p> <p>Machinery spaces that require covers to be opened to enable use of a portable fire extinguisher.</p> <p>Automatic FFE not having arrangements to shut off machinery and fans and close machinery space vents.</p> <p>New boats fitted with FFE containing halon gas. Halon as a fire-extinguishing medium is now illegal in Australia due to its harmful effects on the environment.</p>

Feature	Safety issues	Observations while judging boats
	exposure of persons to the fire.	
Portable fire extinguishers	An important objective of controlling fire hazards is the rapid identification and extinguishing of fire in its early stages. Portable fire extinguishers are key to achieving this outcome. Portable fire extinguishers must be of appropriate type and size for the likely fire risk. They must be located in readily accessible locations on the vessel.	<p>Good features:</p> <p>Boat manufacturers that provide dedicated stowage arrangements for portable fire extinguishers within easy reach but not too close to areas of higher fire risk such as machinery spaces and galleys.</p> <p>Poor features:</p> <p>Portable fire extinguishers kept in unmarked lockers.</p> <p>Portable fire extinguishers that do not comply with Australian Standards. (Owner could be breaching marine safety law).</p>
LPG stowage	To avoid the risk of catastrophic explosion, liquid petroleum gas cylinders must be stored in separate compartments having a drain for any leaking gas that discharges directly overboard.	<p>Poor features:</p> <p>LPG gas storage at the very bow of a boat (adds significantly to the risks associated with collision).</p> <p>LPG gas storage locker within another locker containing ventilation equipment and batteries.</p>
Machinery space accessibility	<p>Ready access to the engines on a vessel is a vital factor to facilitate their regular inspection, proper operation, maintenance and servicing. Accessibility can also be important in an emergency situation.</p> <p>There are two levels of machinery space accessibility. The first is ordinary access for the purposes of inspection, operation and in service maintenance. The second is occasional access for the purposes of more major maintenance and servicing activities.</p> <p>Some vessels address the two levels separately, having additional covers or soft-spots that must be removed to gain access</p>	<p>Good features:</p> <p>Large machinery space covers that give good access at any time.</p> <p>Power operation of machinery covers when manual operation would be too cumbersome.</p> <p>Centre stern platforms on catamarans fitted with two outboards</p> <p>Enclosed machinery spaces that allow a reasonable degree of access right around each engine.</p> <p>Hatchways, inspection covers or soft patches that allow engines to be removed without major dismantling of the vessel.</p> <p>Poor features:</p> <p>Machinery spaces without sufficient headroom to comfortably work (even when kneeling).</p>

Feature	Safety issues	Observations while judging boats
	for major maintenance & servicing.	Access to essential components of the machinery such as filters blocked by tanks, systems, bulkheads, partitions, etc.
Machinery space sound insulation	Sound insulation can have a major affect on sound levels in the vessel, improving comfort and reducing fatigue. However, sound insulation should not add significantly to the fire risk within what is a high fire risk space.	<p>Good features:</p> <p>Sound insulation that is rated for its fire retardant properties (refer to Annex I of Part C Section 4 of the National Standard for Commercial Vessels)</p>
Galley stoves	<p>LPG galley stoves are required to meet relevant State and Territory standards contained in AS5601.</p> <p>Electric and liquid fuel stoves should meet similar standards. There are three main types of fire risk associated with galley stoves. One is the fire risk from the galley fuel (e.g. LPG or mentholated spirits), one is fire risk associated with heat radiation from the heating element and one is fire risk associated with the combustion of cooking fats and oils.</p> <p>There are standards that specify safe distances from heating elements, allowable temperature rises of combustible surfaces and arrangements to protect surfaces by non-combustible materials.</p> <p>Vessels intended to be operated at sea or monohulls undaer sail should be provided with fiddles that secure cooking utensils on the stovetop while the vessel is heeling and pitching in a seaway or heeled by the action of wind or other heeling influences.</p>	<p>Poor features:</p> <p>Smooth top stoves without fiddles on vessels intended for seagoing use.</p> <p>Combustible materials (overhanging shelving, adjacent bulkheads and curtains) too close to the heating element.</p> <p>The enclosures of gimbaled stoves not being protected by fire-restricting materials.</p>

Feature	Safety issues	Observations while judging boats
Bilge pumping	<p>Bilge pumps serve a dual purpose. They ensure that bilges remain relatively dry during normal operation, which reduces deterioration of the hull and damage to internal systems and equipment. Bilge pumps can also serve as a means of damage control in the event of moderate flooding damage.</p> <p>The automatic activation of 12V pumps reduces the likelihood of damage to the pump caused by dry running. However, care is needed to ensure that the bilge discharge is well above the waterline otherwise the combination of automatic operation and a flat battery may cause the bilge system to back-siphon</p>	<p>Good features:</p> <p>Redundancy in bilge pumping arrangements on seagoing boats; e.g., two independently driven bilge pumps; viz. a 12V pump and a manual pump or two 12V pumps with two independent sources of electrical power.</p> <p>Non-return valves on bilge pump discharges</p> <p>Poor features:</p> <p>Boats with automatic bilge pump discharges close to the waterline.</p>
Piping systems in machinery spaces	<p>Breaches in piping in machinery spaces can result in flooding (e.g. rupture of salt water cooling systems, deck scupper discharges) or fire (e.g. rupture of fuel lines).</p> <p>The construction of piping should be appropriate to the risks associated with failure.</p>	<p>Good features:</p> <p>Piping for fuel and seawater systems made of corrosion resistant metal or metal braided materials having arrangements to reduce vibration and a minimum of joints.</p> <p>Poor features:</p> <p>Plastic scupper piping in the machinery space leading to a discharge valve at waterline. There was no means to remotely shut off the valve from outside the engine room in the event of fire.</p>
Safety equipment stowage	<p>Safety equipment will likely be of no use unless it can be deployed in times of emergency.</p> <p>Storage of safety equipment can be as important as the safety equipment itself. Lifejackets, EPIRBs, flares, etc should be stored in a secure location ready for</p>	<p>Good features:</p> <p>Large lockers for storage in cockpits and other open areas.</p> <p>Dedicated stowage locations for EPIRBs near the helm of a vessel or in a place where it can float free if needed.</p> <p>Poor features:</p> <p>Boats that have no proper provision for storage of lifesaving</p>

Feature	Safety issues	Observations while judging boats
	<p>immediate use. Liferafts should be stowed away from rigging and overhanging structures in a location where they can be easily deployed.</p>	<p>equipment.</p> <p>Boats that stow lifesaving equipment in lockers below deck forward.</p> <p>Storages lockers for lifesaving equipment that are not clearly marked as to their contents.</p>
<p>Navigation lights</p>	<p>Navigation lights must meet local regulations based on the International Regulations for Preventing Collisions at Sea, appropriate to the size and use of the vessel. The legislation specifies requirements for the location, number, colour and power of navigation lights.</p>	<p>Poor features:</p> <p>Navigation lights that are obscured by other equipment on the vessel, e.g. fishing rod racks.</p> <p>Navigation lights that become obscured as the vessel trims excessively going through transition to planning speeds.</p> <p>Navigation lights that are mounted in locations susceptible to damage from mooring lines, fenders, anchor cables, etc.</p>
<p>Visibility from the helm</p>	<p>Local collision prevention legislation places a high obligation on the ‘master’ of a boat to keep a proper lookout. Even when another boat has an obligation to give way, there is a general obligation to avoid collision. The arrangement of the helm position is of major importance in fulfilling this obligation.</p> <p>The horizontal extent of vision from the helm should be as clear as possible in the forward sector from the bow to 22.5 degrees abaft the beam port and starboard. Obstructions that block visibility from the helm should also be avoided in the stern sector. Care should be taken to design enclosing structures to minimize any blind spots, taking account the variations in the stature of persons.</p> <p>The vertical extent of vision from the helm should allow the helmsman a clear view from</p>	<p>Good features:</p> <p>Forward facing windows fitted with wipers and washers.</p> <p>Boats fitted with seat bolsters or seat height adjustment at the helm position giving the helmsman flexibility to find the best level for visibility.</p> <p>Twin steering positions or oversize steering wheels on sailing vessels.</p> <p>Poor features:</p> <p>The top of the frame of windscreens located at or immediately below horizon level.</p> <p>Large structures such as targa supports, hard top supports, etc that significant interfere with visibility from the helm within the forward sector.</p> <p>The helm position located aft on a flybridge enclosed by clears without an alternative helm location. Clears provide lesser levels</p>

Feature	Safety issues	Observations while judging boats
	<p>just above the horizon to a point 50 metres or 4 boat lengths from the vessel, whichever is less.</p> <p>Tinting of windows should be avoided to prevent distortion of colours and reduction in transmitted light through the window (both of particular importance at night and during other times of poor visibility. Windows should be designed to minimize reflections.</p> <p>The faster the boat, the more critical it is to have good visibility from the helm. The time to identify hazards, assess risks and respond on boats traveling at speed is shortened. Early identification of hazards is therefore paramount.</p>	<p>of visibility than rigid windows, especially at night or in bad weather, and their performance is likely to degrade further over time.</p> <p>Locating the helm position well aft on boats that are prone to large angles of trim at maximum speed or as they pass through transition to planning speed.</p> <p>Tinting of forward facing wheelhouse windows reduces light transmission and may interfere with colour recognition.</p> <p>Forward facing windows that exhibit excessive amounts of reflection, e.g. windows raked back at an acute angle that reflect light from a large lightly coloured or white dashboard.</p> <p>Obstructions within the critical sector 30 degrees each side of centre forward including vertical window supports, liferafts and wiper motors.</p>
Helm ergonomics	<p>The layout of the helm and control console can either facilitate or hinder the functions of the helmsman. The faster the vessel, the more significant the role of ergonomic design.</p> <p>The helm position should be arranged to facilitate the functions required to navigate the boat safely. Unnecessary instrumentation, features that cause discomfort or fatigue and other potential distractions should be avoided.</p>	<p>Good features:</p> <p>Boats that have essential monitoring, control, communication and navigation functions centralized and within easy reach of the helmsman.</p> <p>Steering wheel height adjustment.</p> <p>Poor features:</p> <p>Boats without seating or with uncomfortable seating for the helmsman, seating without fore and aft adjustment, seating without comfortable foot rests, seating that cannot be properly secured in a seaway.</p> <p>Engine throttle controls that are mounted too close to adjacent structure for comfort in use.</p> <p>Compartments that contain the helm arranged with persons to be normally seated in front of the helm position.</p>

Feature	Safety issues	Observations while judging boats
Information essential for safety	<p>Occupational health and safety legislation and the general law requires the designer, manufacturer and suppliers to identify, record and pass on to users information that is essential to the safe operation of the boat.</p> <p>There are two main ways this is done. The first is via a compliance plate (such as the new Australian Builders Plate) that summarizes the key safety limitations on use for ready reference by those on the boat.</p> <p>The second is via operating and maintenance manuals which contain more detailed requirements pertaining to safety, as well as information concerning warranties, care of the boat, etc.</p>	<p>Radios located remote from the helm position on boats that operate at speed.</p> <p>Good features:</p> <p>Vessels fitted with a compliance plate in accordance with the National Standard for the Australian Builders Plate.</p> <p>Vessels provided with a manual intended for the particular vessel or model of vessel that complies with ISO standards or follows the guidelines specified in ABYC T-24.</p> <p>Poor features:</p> <p>Vessels without a compliance plate and an operating manual.</p> <p>Compliance plates that are located in positions remote from the helm (including inside the door of lockers), compliance plates that are illegible, compliance plates that do not contain all essential information on limitations on the use of the vessel (including types of waters).</p> <p>Operating manuals that are not complete (e.g. a collection of plans without explanation), operating manuals that are generic and do not refer to the safety limits of the actual vessel (or even to the compliance plate that specifies limits), operating manuals that focus on limiting the potential for warranty claims.</p>
Health and hygiene	<p>There is often a conflict between the need to secure a boat from the entry of water and the need for fresh air in enclosed spaces, particularly bathrooms and galleys.</p> <p>Insufficient ventilation can result in the build-up of carbon monoxide or other toxic gases within spaces occupied by persons (from machinery, galley stoves, heaters, etc). It can also result in the build-up of bacteria and</p>	<p>Good features:</p> <p>Vessels arranged with dorade vents to accommodation spaces that permit continued circulation of air even with all ports, doors and skylights secured.</p> <p>Vessels fitted with carbon monoxide detectors in accommodation spaces.</p> <p>Poor features:</p> <p>Accommodation spaces, especially bathrooms dependent on</p>

Feature	Safety issues	Observations while judging boats
	<p>fungi in enclosed spaces.</p> <p>Accommodation spaces should have arrangements for ventilation that continue to operate even when the boat is secured against the entry of persons, rain or sea.</p>	<p>opening ports and skylights.</p> <p>Boats fitted with awnings and clears that give rise to a 'station wagon' effect when underway, drawing exhaust gases into the accommodation space.</p>
Rig on sailing vessels	<p>The rig of sailing vessels should be arranged to facilitate sail being set, adjusted and furled efficiently and with a minimum of movement on deck by the crew.</p> <p>The rig should be arranged for quick spilling of wind in the event of a gust or squall.</p> <p>Booms, sheets and other sources of potential injury should be arranged to minimize the risks to persons on board.</p>	<p>Good features:</p> <p>Mainsheet located outside the cockpit on the coach-house roof or on a targa aft.</p> <p>Boom located above the level of standing height in the cockpit.</p> <p>Concealed leads for running rigging on deck.</p> <p>Power operated winches and self-tailing winches.</p> <p>Self-furling arrangements for headsails.</p> <p>Lazy jacks and sail bag or self-furling mainsail.</p> <p>Self-tacking headsails without overlap.</p> <p>Labels for quick identification of the function of lines.</p>