BOAT SAFETY SCHEME®
Go boating - Stay safe

A guide to the Non-Private Boat Standards

The current BSS Non-Private Boat Standards are currently under review.

If you require a copy of the current standards please contact the BSS Office.

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Inboard Engines

Boats are designed to keep water out of their hulls - which means they also act as good containers for leaks or overflows of flammable liquid!

Keeping or using fuels such as diesel or petrol in confined and undrained spaces obviously carries a risk of providing fuel for a fire or explosion. The main aim of this Part is to keep fuel away from sources of ignition for as long as possible.

This can be achieved by making sure that your fuel filling and fuel supply arrangements don't allow fuel to accumulate inside the confines of your boat. You can help to minimise the risk of a fire starting and spreading by ensuring all fuel system components are kept in good condition, are fire resistant (see flexible hoses, fuel pipe and hose connections and fuel filters) suitable for the fuel being used and kept away from sources of heat.

The provisions of this section of Part 2 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

This Part applies to all boats with inboard engines and to other fixed fuel systems to appliances such as diesel heaters. Part Eight of the Examination covers the standards for the remaining aspects of oil-fired appliances.

Part 2 Inboard Engines

Deck Connections

The provisions of this section of Part 2 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Labelling all deck connections will help prevent cross-contamination between different fuels, water and other liquids. Many deck connections and fittings are already marked to show their purpose but, if they aren't, you must clearly mark them by putting a label on or immediately beside them to indicate their purpose. The label must be clear, permanent and tough enough to do the job it's designed for. You can paint on the signs, if you prefer. You must label the exact type of fuel that is being used, e.g. petrol, diesel, paraffin etc. - simply labelling it 'fuel' isn't enough!

Cross-contamination, such as petrol being added to the water system, can become a fire hazard. It's recommended that your boat's deck and filling connections are set up in such a way to minimise the risk of this happening. [2.3]

A boat fire became very serious when petrol which had escaped into the bilges was ignited.

The fuel had leaked from a filler hose that had been detached from the spigot on the fuel tank. Investigations showed that although from outward appearance the hose appeared sound, petrol had seriously permeated the hose over a period of time causing it to deform and become detached from the tank spigot. It turned out that the hose never was suitable for use with petrol and a dangerous situation had been building up for a long time. Fortunately the boat wasn't in a lock, marina or near anything else when the fire occurred. [2.3]

Vent Pipes

To help minimise the risk of fuel blowback it's important to allow air to be expelled from the fuel tank as it's being refilled. The fuel tank also needs to be able to 'breathe' to help the supply of fuel to the engine. Extreme temperature changes causes the volume of fuel to expand and contract. Fitting an effective vent pipe minimises the strain on tank seams and fittings when this occurs. To achieve this, a vent pipe with an internal diameter of no less than 12mm (1/2ins) must be connected to the highest point of every fuel tank.

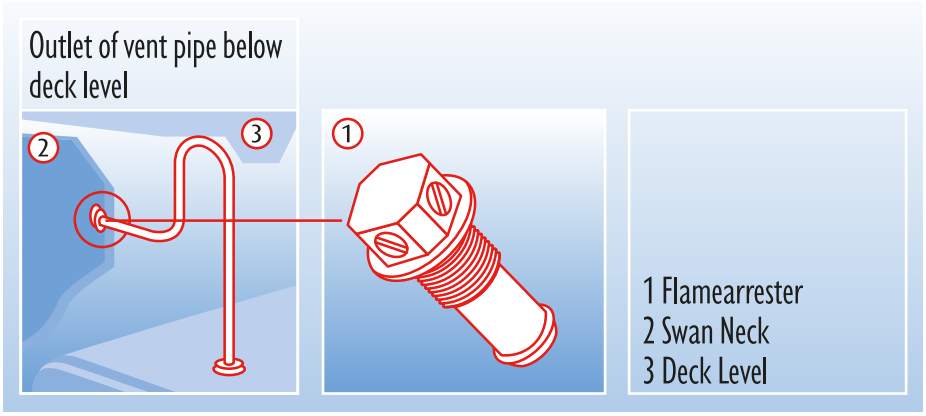
To reduce the risk of fuel leaking past the joints and into the boat the vent pipes must be connected with leakproof joints. To help prevent the blowback of fuel and ensure the hose doesn't collapse, the pipe must be made of a strong non-kinking material.

If the vent hose is not marked as being suitable for use and you don't have relevant evidence from the supplier confirming its suitability, it's recommended that the hose is replaced with one complying with BS EN ISO 7840, SAE J1527 or DIN 4798.

Abrasion damage to the vent pipe, caused by rubbing against internal fittings, could cause it to leak fuel into the boat. To reduce the risk of this happening it must be of minimum practical length and must be well supported at regular intervals throughout its length.

Don't forget, fuel tank vent pipes must always be on a continuous rise.

If they dip at any point on the way, this allows fuel to lodge in the dip and block the vent, rendering it useless. Inadequate tank and pipe ventilation can lead to a dangerous build-up of explosive fuel vapour. [2.4]



The minimum internal diameter of a vent pipe must be 12mm (1/2ins). Boats manufactured before 16 June 1998, which have a vent pipe with a minimum internal diameter of 9.5mm (3/8ins), are exempt from this part of this Standard. Boats with fuel systems complying to ISO 10088 which have a vent pipe with a minimum internal diameter of 11mm are also exempt from this part of this Standard.

Older boats not originally fitted with individual tank vent lines can use the filling pipe as the vent. This option to meet vital fuel vapour ventilation requirements is available if there is a vent in the fuel filling cap which incorporates an effective flame arrester. [2.4]

Vent Pipe Outlets

The provisions of this section of Part 2 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Pollution can be caused by fuel coming out of the vent terminal when the fuel tank is overfilled. To minimise waterway pollution the vent pipe outlet must be at a height that is equal to, or greater than, the height of the deck filling connections. It's recommended that the position of the vent pipe outlet is at least 100mm (4ins) above the filling point.

The outlet of the vent pipe can be below the level of the deck filling connection, as long as there's a swan neck in the line that extends the pipe to a point just beneath the filling connection.

As the vent pipe will be regularly 'breathing' fuel vapour, the outlet must be positioned away from potential sources of ignition.

Any flame close to or at the end of the vent pipe could flash back into the fuel tank. Because of this, each vent pipe opening must be fitted with an effective flame arrester (see diagram - outlet of vent pipe below deck level) that prevents flashback. It's recommended that the flame arrester has gauze with mesh not less than 11 to the linear centimetre (or 28 to the linear inch) and to be effective the gauze must also completely cover the pipe opening. You can help maintain its effectiveness by keeping it clear of debris such as paint or spiders' webs. [2.5]

Part 2 Inboard Engines

Fuel Tanks

It's worth taking a moment at this point in the Guide to consider how important these particular Check List items are. A tank of fuel catching fire and exploding is one of the most serious risks anyone could face. Fortunately it very rarely happens these days because of the high level of safety these Check List items afford. If you want to find out more about the nature of fuels see appendix a.

Any damage to the fuel tank, pipework or fittings, caused by movement, could cause fuel to leak and create a dangerous situation. To reduce the risk of this happening fuel tanks must be properly secured.

It's recommended that your boat's fuel tank is installed as low as is practical to assist boat stability and reduce strain on the tank and its fittings.

To reduce the likelihood of the tank deteriorating, and fuel then seeping into the boat, fuel tanks must be made of corrosion-resistant material, which is suitable for the fuel being used.

Suitable Materials Include:

Diesel Fuel	Petrol
Untreated mild steel	Aluminium alloy†
Mild steel*	Lead-coated steel
Aluminium alloy†	Brass
GRP	Copper (tin coated internally)
Stainless steel	Internally galvanised mild-steel
Fire-resistant polyethylene tanks††	Stainless steel
	Fire-resistant polyethylene tanks††

The Following Must Not Be Used:

Diesel Fuel	Petrol
Lead coated steel	Untreated mild steel
Copper	Interior painted tanks
Internally galvanised steel	GRP

*hot dip zinc coated after fabrication †containing not more than 0.1% copper. ††These must be suitable for use within inland waterways craft. Unsuitable types of plastic materials can be susceptible to cracking and permeation, leading to an accumulation of fuel vapour within the confines of a boat. Further advice and information sheets are available from the BSS Office.

If there is a fire near the tank, you will need to ensure that the tank materialdoes not immediately fail, leaking more fuel into the fire and causing it to escalate. Whatever material your tank is made of, it must have a fire resistance of at least 21/2 minutes (in accordance with BS EN ISO 10088). However, the greater the fire resistance, the more protection there will be from the risk of the tank failing.

To be sure of the sound construction of your fuel tank, so that it doesn't leak fuel during everyday use, your tank has to have undergone a pressure test of 0.25kgf/cm2 (or 3.5lbf/in2) before being used, and must be marked to indicate this. All joints and seams on tanks must be properly welded, brazed or closeriveted to sustain that test.

Fuel Tanks - Continued

Boats built before 16 June 1998 do not need to comply with the requirement for pressure testing and marking on fuel tanks, but you do still need to make sure that tanks, joints and seams are not corroded or damaged to such an extent that leaks might occur. [2.6]

Looking for the flame trap on your vessel? It could be fitted in the handrailabove the fuel tank. This is quite a common practice with some narrowboat builders. The uprights of the rail form the vent pipe and the top of the tankwill have been drilled before the rail is fixed. [2.5]

Petrol & Parafin Tanks

If petrol or paraffin tanks are placed near an engine or heating appliance there'sa danger that they could give off flammable vapours, which if ignited could cause a fire or explosion.

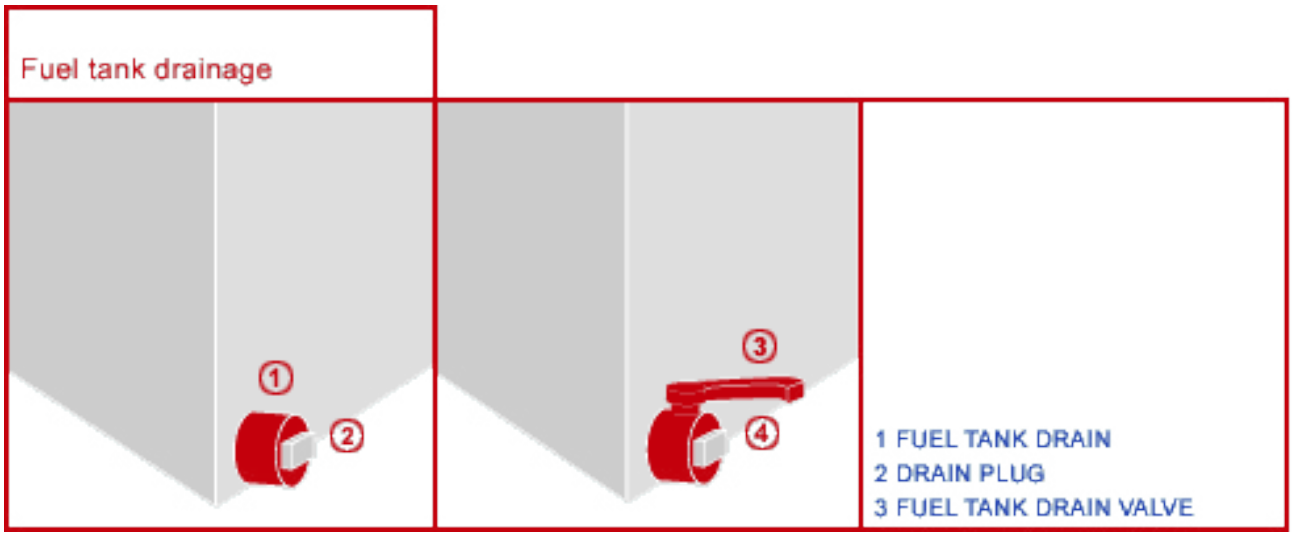
To reduce the risk of this happening, it's a good idea for your boat's petrol or paraffin tanks to be installed as far away as possible from an engine or other heat source. In any event, they must not be installed closer than 100mm (4ins) to the engine or any other heat source. [2.7]

Fuel Guages & Dipsticks

Glass or plastic fuel sight tube gauges can easily be damaged by knocks or theheat from a fire and can therefore only be used on diesel tanks.

Where they are used they must be fitted with self-closing valves at the top and bottom (or bottom only, if the top connection is on the upper surface of the tank), and must be protected against damage, e.g. by use of a cage, by design, or by position. If your fuel tank is fitted with a permanent dipstick arrangement it must be vapour-tight to prevent fuel or vapour leaking into the boat.

Damage can be caused to the bottom of your boat's fuel tank(s) if you allow a portable dipstick to strike it. This could eventually lead to a fuel leak. To prevent this from happening it's recommended that you fit a cross pin arrangement,wider than the fuel filling connection, to the dipstick. [2.8]



Fuel Tank Accessibility

In order for the fuel tank condition to be checked for leaks, the tank must be accessible, i.e. easily reached and at least partly visible.

Fuel Tank Connections – Accessibility

For the same reason all connection points on the fuel tank (normally fuel filler, fuel vent pipe, fuel supply and (for diesel) fuel return connections) must also be accessible for inspection and routine maintenance. [2.9]

Part 2 Inboard Engines

Bonding

The provisions of this section of Part 2 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

The build-up of static electricity, from fuel flowing through the filling pipe, has been known to cause a significant spark at the filling point, which in turn has ignited petrol vapour in the area. To reduce the risk of this happening petrol tanks must be electrically bonded to their deck filling connections by low resistance metallic conductors.

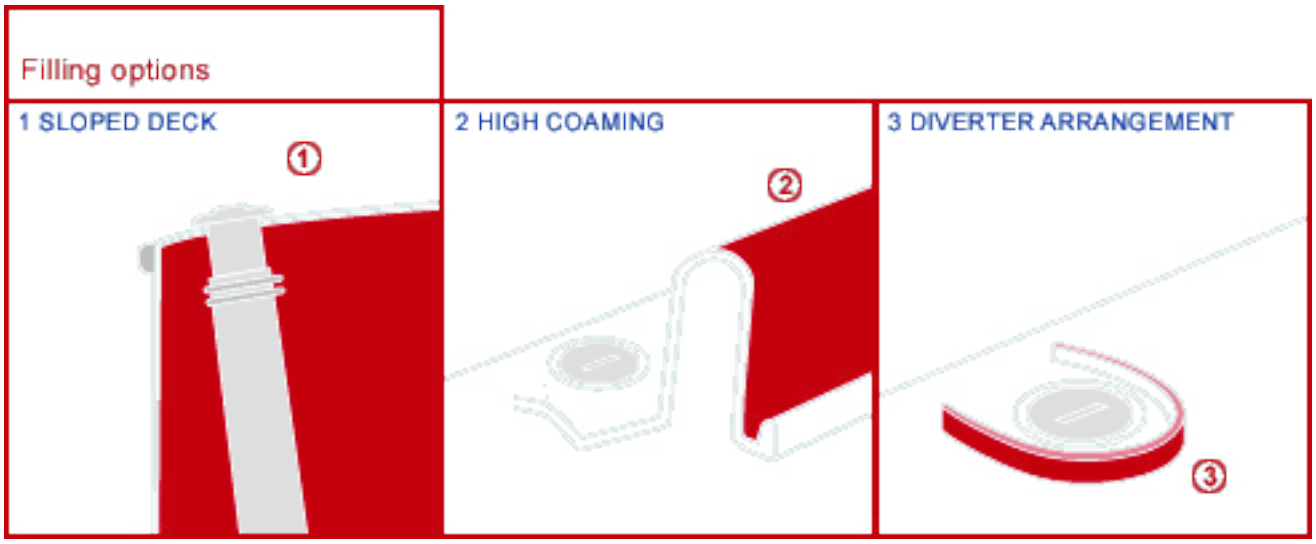
If the boat has a non-conducting deck or hull, such as wood or glass-fibre reinforced plastic (GRP), fuel tanks must also be electrically bonded to an earthpoint, e.g. sea cock or stern gear, which is in direct electrical contact with the surrounding water, creating an earth and discharging any static electricity. If the filling pipe is already of a conducting material, such as copper, there is no need to provide an additional conductor. It's recommended that you follow these precautions if your boat has diesel fuel systems. [2.10]

Tank Drains

To help stop fuel leaking past tank drains which are worn, or which have not been properly closed, tanks must be fitted with a suitable drain valve.

This must also be fitted with a plug on the outlet. Boats manufactured before 16 June1998, which have a fuel tank drain without a valve, are exempt from this part of this Standard. [2.11]

Fuel Filling Systems



The provisions of this section of Part 2 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Spilling fuel into your boat means there is a risk of fire or explosion if that fuel or fuel vapour becomes ignited. To reduce this risk the filling point must not let any fuel spill into the boat, including the bilges. Three examples of how to achieve this are shown above.

Inside a confined space even a small amount of potentially flammable fuel carries a serious risk of fire or explosion.

Small amounts of fuel can be diluted if they escape overboard. If large quantities of fuel or other substances escape into a watercourse you should contact the Environment Agency Pollution Hotline on 0800 80 70 60 (24hrs) or the Scottish Environment Protection Agency on 0345 73 72 71.

To make sure that any fuel filling nozzle is properly inserted and to prevent 'blowback' of fuel when refuelling, the fuel filling system must have an internal diameter of at least 31.5mm (or 11/4 ins). It is good practice to use a fuel filling system with a larger diameter since this further reduces the risk.

To stop a flexible filling hose from collapsing if it's bent, which could cause blowback or a leak, the hose must be of a strong, non-kinking material which is not easily compressed or squeezed. This is particularly important if the hose needs to be bent at an angle when routed from the tank to its deck connection.

All flexible hoses perish over time as a result of the hose material reacting with the fuel. To minimise leaks the fuel filling hose must be made from a material that's suitable for the fuel that it carries.

If the filling hose is not marked as being suitable for use and you don't have relevant evidence from the supplier confirming its suitability, it's recommended the hose is replaced with a fuel filling hose complying with BS EN ISO 7840, SAE J 1527 or DIN 4798.

To help prevent fuel leaks, the filling hose or pipe must be connected with leakproof joints between the top of the tank and the filling point. Care must be taken when using worm-drive clamps to ensure they are the right diameter for the hose to maintain a leakproof joint. It's recommended that, during routine maintenance, you check the condition of clamps that are used to make joints. They must be replaced if they appear damaged or corroded.

Fuel Filling Systems - Continued

For additional protection, it's recommended that you use double clamps on a filling hose used for petrol.

To help prevent abrasion damage against interior fittings, filling hoses must be well supported at regular intervals.

Fuel must be able to drain back into the tank and not be retained in the filling hose, since this could cause blowback when refuelling and may contribute to a deterioration in the pipe's condition. The filling hose therefore must be of the minimum practical length and continuously rising between the tank and the filling point.

To reduce the risk of leaks it's essential that all joints and connections must either be seen or felt to check their condition. [2.1] [2.2]

Fuel Supply & Fuel Return Pipes

The provisions of this section of Part 2 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

No piping system is immune from the risk of fracture and in the event of this happening it's essential to provide a way to minimise the risk of losing all of the tank's contents (see also fuel pipe & hose connections, fuel filters and fuel cocks & valves). For this reason fuel supply lines in petrol systems must be taken through the top of the tank, with the only exception being for purely gravity-feed systems found on older boats. In these cases the fuel feed will be at the bottom of the tank and there must be a shut-off valve or cock fitted at the tank connection.

Again, it's a good idea if your boat is powered by diesel to ensure the fuel feed or return pipes are drawn through the top of the tank, or as near to the top of the tank as is practical.

Any diesel-fuelled boats built to comply with ISO BS EN 10088 should already have fuel feed pipes entering through the top of the tank or at the top of the side of the tank. If feed or return pipes are fitted below this level, they will be protected by a valve or cock attached to the tank, unless the pipe is welded to the tank and reaches above it. [2.12]

Fixed Fuel Feeds

To minimise the risk of a fuel leak being ignited by a hot surface and starting a fire, fixed fuel pipes must be positioned well away from any potential source of heat, such as exhaust systems and heating appliances.

All fixed fuel feeds and pipes permanently charged with fuel, including balance pipes, must be made of fire resistant and impact resistant material: softened copper, stainless steel, aluminium alloy or (for diesel installations only) mild steel of suitable size.

Fixed pipes can become damaged and release fuel over time because of the effects of vibration and strain, and so must be firmly supported, at approximately 500mm (20ins) intervals. [2.13]

Balance Pipes For Multiple Fuel Tanks

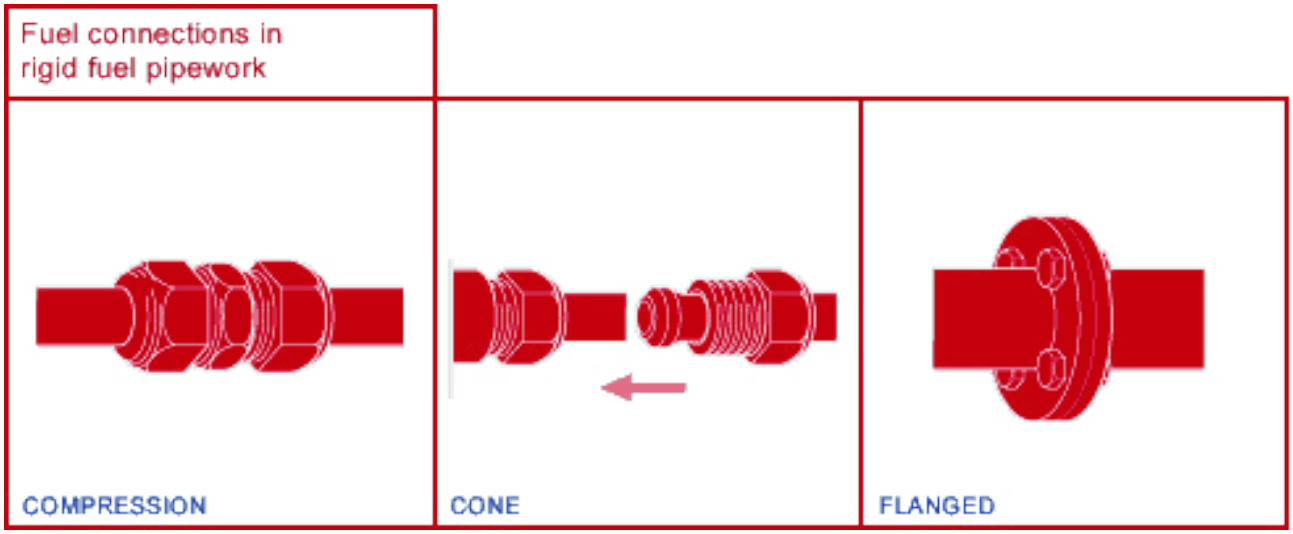
Balance pipes are only permitted in diesel fuelled installations.

The risks of allowing them in petrol installations, where failure could lead to a bilge full of a volatile fuel, are simply too great. In the event of the balance pipes failing, there needs to be a way of shutting off the flow of fuel into the boat. This means that any balance pipe between fuel tanks must be fitted with valves directly attached to the tank. The valves must be leakproof and efficient.

Diesel fuelled boats manufactured before 16 June 1998, and fitted with a balance pipe between close-coupled tanks (where there is insufficient space to fit valves), are exempt from the requirement to fit valves directly attached to the tank. If the connection between the fuel tanks is made of the same material as the tanks and is also permanently connected by welded or brazed joints, it's treated as an integral part of the tank and not as a balance pipe.

A fire started in the engine compartment after a jet of diesel fuel droplets sprayed over a hot exhaust pipe.

Luckily the owner became aware of the fire and was able to put it out using a portable fire extinguisher. Worryingly the fire took place in a lock! [2.14]



Flexible hose, including armoured hose, can be used for balance pipes provided the hose is manufactured to, at least, the fire resisting qualities of either BS EN ISO 7480, SAE J 1527 or DIN 4798 and a valve is fitted at both ends. [2.13]

Flexible Hoses

The useful life of flexible hose depends on many factors, including storage and operating conditions, and the hose may need to be changed several times during the lifetime of your boat.

Flexible hose also has a lower fire resistance than metallic pipe and for all these reasons it is recommended that the length of hose used in the fuel system is restricted to the absolute minimum, i.e. the minimum length necessary to cope with vibration or the movement of engines and boat structures.

The additional benefit of this is that the amount of hose exposed to the risk of early failure through damage from heat and abrasion will be minimised. All hose used in the fuel system must be fire resistant to at least 21/2 minutes, as specified in the internationally agreed marine fuel hose Standard (BS EN ISO 7840), although there are hoses available with superior fire resisting qualities (e.g. BS ISO 15540). Both of these hoses will also meet the current requirement for reinforcement and wall thickness.

Injector leak-off (spill rail) arrangements must meet all the requirements for fuel feed and return pipes, hose and connections, or

- utilise the direct return to tank option, or
- return to the fuel system through a non-return valve.
- injector leak-off hoses fitted by the manufacturer within an enclosure on the engine meet the requirement.

Vintage and traditional engines designed to return the injector leak-off fuel to a catch pot are acceptable provided the catch pot is securely mounted and is free of signs of leaks, signs of damage or deterioration.

There is more information on this link

You should contact your marine engine supplier for further details.

Engines that are certified to International Standards, i.e. ISO 16147 for diesel, ISO 15584 for petrol, are acceptable since these Standards support the Recreational Craft Directive. It's recommended that you bear these Standards in mind when buying an engine. [2.14]

Flexible Hoses - Spill Lines

Injector leak-off arrangements - spill lines (also known as spill rails and spill racks)

What is a spill line?

The diesel fuel injector's role is to inject an atomised, spray of fuel into the engine. Its components include a spring-loaded needle that opens and closes rapidly allowing fuel to flow through the injector nozzle holes. Lubrication is crucial to this action and this is provided by a tiny amount of fuel that 'leaks' back past the needle into the body of the injector. This 'leaked' fuel finally leaves through a connector of various designs, depending on the manufacturer, to the spill line that returns the fuel to the tank or the fuel system.

The old BSS requirements for spill lines were that they had to be either of metallic material or fire resistant hose to at least BS EN ISO 7840. Where hose was used it had to be efficiently attached to injectors with clamped or swaged threaded connectors.

However that option was inconvenient for a small number of engines because available conversions require machining of injector bodies leading to difficulties with warranties, spares availability and cost.

To assist owners of these engines BSS Technical Committee were asked to investigate the risks presented by non-compliant arrangements and potential compliance options not affected by the constraints above.

The current option is that injector leak-off (spill rail) arrangements must meet all the requirements for fuel feed and return pipes, hose and connections, or

- utilise the direct return to tank option, or
- return to the fuel system through a non-return valve.
- injector leak-off hoses fitted by the manufacturer within an enclosure on the engine meet the requirement.

Vintage and traditional engines designed to return the injector leak-off fuel to a catch pot are acceptable provided the catch pot is securely mounted and is free of signs of leaks, signs of damage or deterioration.

Detail

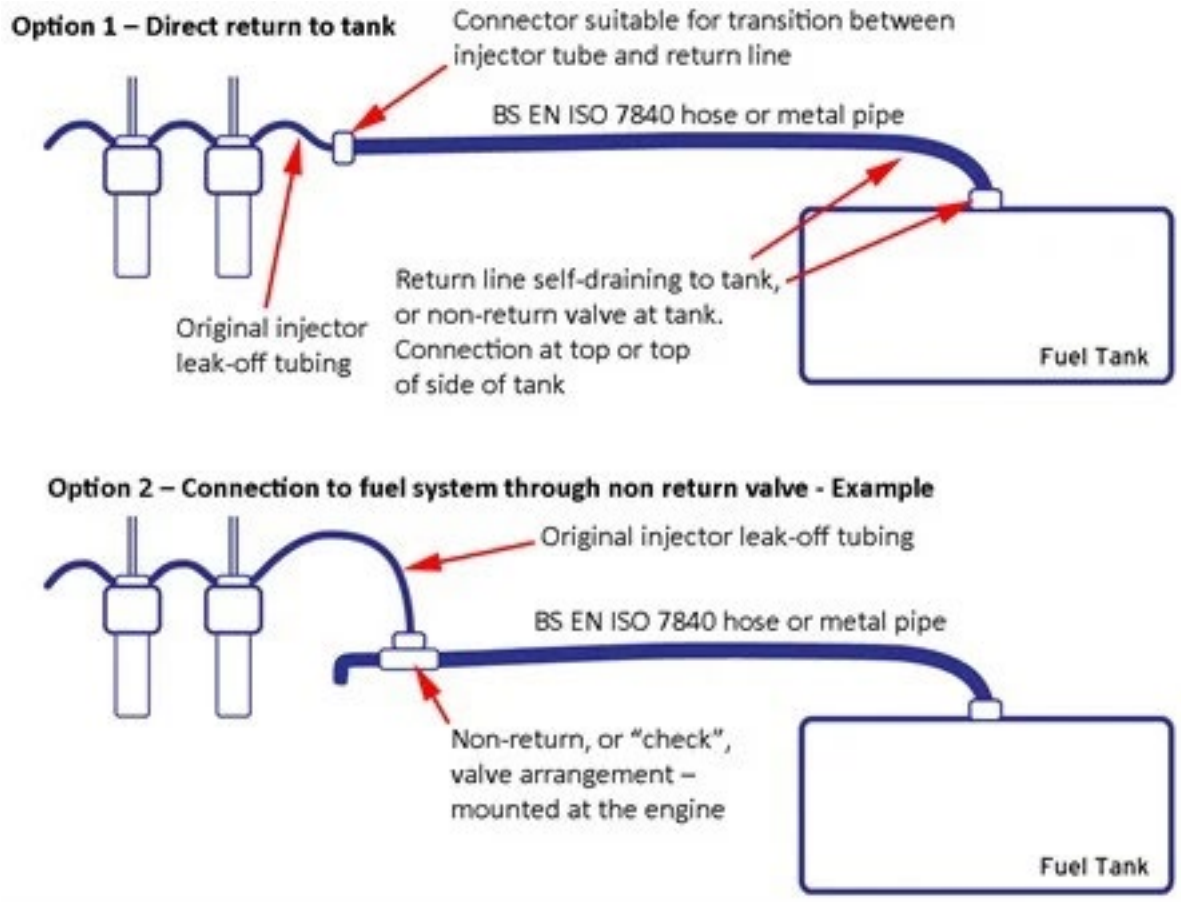
Supported by the evidence of the research, the current compliance options were developed on the basis that only a small amount of fuel flows from the injector leak-off points.

The risk being managed is that of adding fuel to a fire in the event of the heat destroying the generic polymer spill line within two-and-a-half minutes, i.e. the minimum standard of protection in the other parts of the fuel system. Such a rupture would allow diesel in other parts of the fuel system to back-flow and escape from the spill line, thus adding to the intensity of the fire and the associated dangers.

Option one - 'return-to-tank' (see diagram)

This is a straightforward concept where the leak-off fuel is returned directly to the tank through a line of recommended minimum internal diameter 3.2mm. It must self-drain to the tank or enter the tank through a non-return valve. Such an arrangement means there is no connection with any other part of the fuel system (except the tank) and no risk of backflow of fuel in the event of failure. The injector tubing is original equipment but the return line to the tank is ISO 7840 hose (or equivalent) or metallic pipework.

Flexible Hoses - Spill Lines - Continued



Option two - 'check valve' (see diagram)

This option routes the leak-off fuel through a check valve to a T-branch or junction with the injector pump fuel-return line. The check valve prevents reverse flow and the potential for fuel to be pumped out of a failure point should a rupture happen.

There are now complete proprietary items to fit many engine arrangements. These are often neat options carefully designed to fit the engines taking into account the often awkward angles and challenging spaces.

Photo courtesy of Marine Injector Services

Flexible Hoses - Spill Lines - Continued

When the NRV option was first announced, a custom non-return or check valve was presented as a possible solution. While the check valve and the T-branch were standard catalogue items from companies such as Delphi and Wade, the connector required some drilling and welding or brazing. (See annotated photograph below). A typical parts list might include:

- **Proprietary fuel line non-return or 'check' valve**
- **Proprietary fuel line 'T' branch (shown with compression fittings)**
- **Annealed copper, alloy or similar fire-resistant, leak-proof washers prevent fuel seepage from the connections**
- **Custom made connector: standard nozzle brazed, welded or silver soldered to drilled-out blank.**

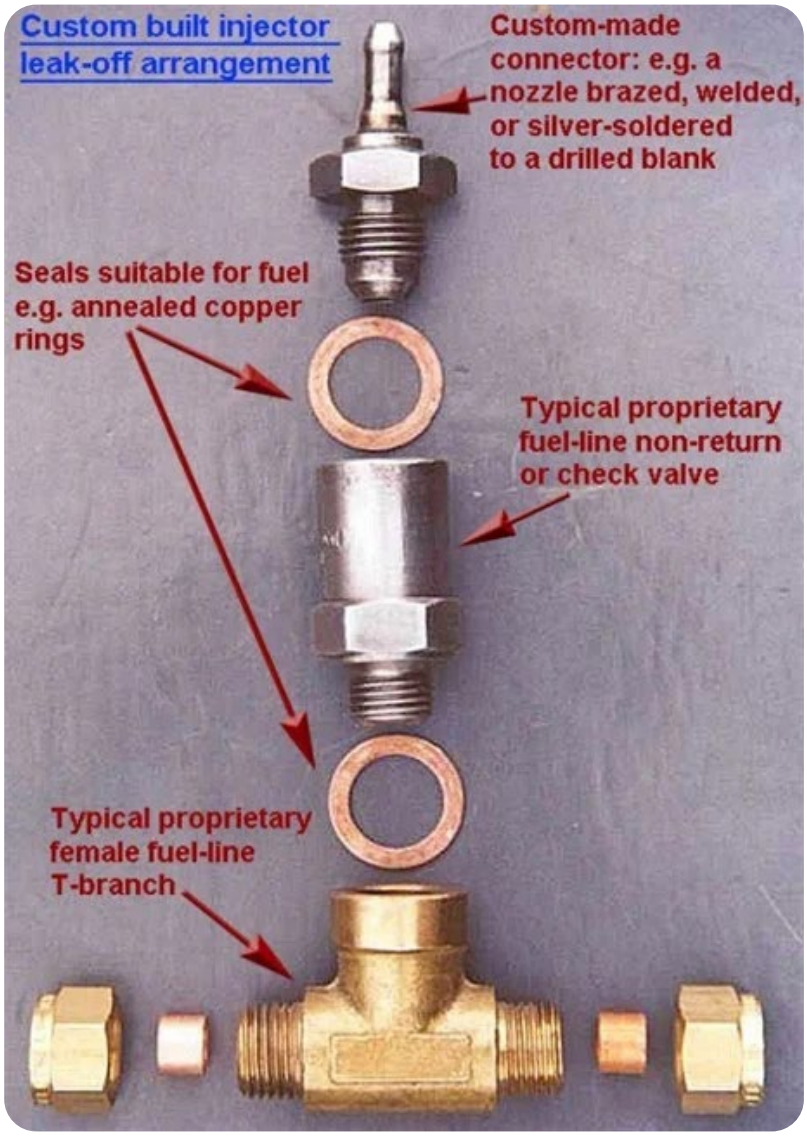


Photo courtesy of Marine Injector Services

Fuel Pipe & Hose Connections

To reduce the risk of fuel connections leaking, any connection which permanently carries fuel must be made with efficient screwed, compression, cone brazed or flanged joints (see diagram - Fuel connections in rigid fuel pipework).

Soft soldered and push-on joints will quickly fail if exposed to excess heat, potentially adding more fuel to a fire. They must not be used. Where flexible hoses are connected to rigid components of the fuel system, e.g. pipes and filters, the connections must be made with metallic clamps onto proper hose nozzles. It's not acceptable to just push a flexible hose over the bare end of a rigid pipe - even if a clamp is used! [2.15]

Fuel Filters

Fuel filters can be prone to the heat from a fire and impact damage. Failure of a fuel filter can lead to additional fuel being added to any fire.

You must only use appropriate fire resistant and impact resistant fuel filters designed for marine use. Clear bowl, glass or plastic filters meeting these criteria are acceptable, as long as they are designed for use with the fuel-type. Alternatively fuel filters marked with ISO 10088 are also acceptable. [2.16]

Fuel Cocks & Valves

The provisions of this section of Part 2 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

To prevent fuel loss from the tank if the fuel feed pipe fails, a fuel cock or valve must be fitted in the fuel feed pipe, as near as possible to the tank. The fuel cock or valve must be readily accessible, so that it's easy to reach and operate as soon as it's needed. As it could be a crew member or even a fire-fighter who is trying to shut down the fuel supply, its position must be clearly marked. It's also a good idea to have some way of operating this valve or cock from outside your boat's engine compartment.

Alternative ways to meet this requirement include:

- making sure all fuel pipes, including those on the engine, are above the top of the tank, so that all fuel in the pipe can drain back to that tank in the event that the pipe is damaged
- fitting an anti-syphon valve on the tank
- fitting a manual shut-off valve in the fuel feed line at a point where the line is self-draining to the tank
- fitting a solenoid valve (with an emergency manual over-ride) at the tank which is only open when the engine is being started or running.

In the event of a fire in the petrol-engine space it's vital that the fuel cock or valve can be easily accessed, so that the fuel supply can be cut off immediately. In all gravity-fed petrol engine installations where the steering position is away from the fuel tank this means a second fuel cock, or other means of operating the main cock or valve must be fitted close to the helm. [2.17]

Second Fuel Cock On Petrol Engines

In the event of a fire in the petrol-engine space it's vital that the fuel cock or valve can be easily accessed, so that the fuel supply can be cut off immediately. In all gravity-fed petrol engine installations where the steering position is away from the fuel tank a second fuel cock, or other means of operating the main cock or valve must be fitted close to the helm.T

Fuel Pipes In Bilges

The provisions of this section of Part 2 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

To reduce the chance of fuel pipes corroding, which could cause them to leak, fuel pipes must be installed above bilge water level. Bilge water level can usually be determined by the presence of:

- a 'tidemark'
- the position of the bilge pump or its inlet
- the level at which the float switch is set.

It's a good idea to run your boat's fuel pipes as high as possible to prevent them from being accidentally damaged. If they run under the cabin floor it's recommended that they are as close to the underside of the floor as possible. [2.18]

Carburettors

Petrol can overflow as a result of a flooded carburettor, and this means there's a danger of petrol leaking onto a hot engine or exhaust and potentially starting a fire or causing an explosion. To reduce this risk, carburettors (apart from the down draught type) must be fitted so that they allow any overflow to drain into a spirit-tight metal drip-tray.

The top of the tray has to be covered with a flame arresting mesh, made of copper or brass gauze, which is soldered to the rim of the tray. The tray must be removable or fitted with a fuel cock for emptying. A flame trap or air filter must be fitted to the air intake of petrol, petroil and paraffin engines. This will help to intercept flames produced as a result of an engine backfire. [2.19]

Securely Installed Engine

Damage to the pipework and fittings of the engine, which could lead to fuel leaks, can be minimised by ensuring that the engine is securely installed and not able to move in any direction, other than the movement allowed by flexible mounts.

This will also help ensure that the engine linkages don't become damaged which could lead to loss of control of the boat if the engine ceased. The engine mounting system must not show any obvious signs of damage such as corrosion, other deterioration, bolt or engine foot fractures. [2.20]

Reversing And Stop Controls

The provisions of this section of Part 2 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

To assist control whilst manoeuvring, every boat must have an effective means of reversing which can be operated from the steering position. Boats manufactured before 16 June1998 are exempt from this part of this Standard. To ensure that your engine can be turned off in the event of an emergency, such as throttle or gear linkage failure, it's a good idea for the engine stop control to be located as near to your steering position as is practical. [2.21]

Oil Tight Tray

To stop oil leaking into any part of the boat, or overboard and causing pollution, an oil-tight tray must be fitted beneath every engine and gearbox. This will also stop oil and oil soaked debris building up within the engine space and fuelling a fire.

To prevent the oil from spreading or spilling out of the tray, the sides must be as high as practical and the tray must be made of an appropriate, non-porous material, such as metal.

A tray is not necessary if oil-tight structural members are fitted fore and aft of the engine. To reduce the chance of oil entering the watercourse and causing pollution, fixed bilge pumps must not draw from the oil tight area or tray. [2.22]

Exhaust System Cooling

To reduce the possibility of an exhaust hose fire, the exhaust system must be cooled effectively. For the same reason it's also advisable to cool your boat's engine cylinders wherever possible.

In air-cooled engines, or where water is not passed through the exhaust system, the exhaust pipe silencer and flanges must be well lagged or shielded. This will reduce the risk of a fuel source being ignited by contact with a hot surface and will also protect individuals from injuring themselves by touching a hot metal exhaust. [2.23]

Part 2 Inboard Engines

Exhaust Noise

The provisions of this section of Part 2 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

To avoid noise nuisance it's recommended that exhaust noise is suppressed. It's also worth remembering that exhaust gas leaks can be lethal if allowed to build up over a period of time. [2.24]

Steam Powered Engines

To minimise the risk of a potential pressure system explosion, a steam powered engine needs to have regular checks and comply with industry practice.

Any steam powered engine installation pressure system must have a current inspection certificate, issued by a competent boiler inspector. For your own protection it's recommended that the pressure system is covered for third party risks by a current insurance policy.

If the boiler is fuelled by Liquefied Petroleum Gas (LPG) it must comply with Part Seven of these Standards. If the boiler is fuelled by diesel, paraffin or similar fuels the fuel installation must comply with this part of this Standard. In the case of a dual fuel system a flame failure device is not required as long as the boiler is constantly attended when in use. [2.25]

LPG Propelled Vessels

To minimise the risk of damaging carburettor components, which could cause a petrol vapour explosion, all boats with internal combustion engines fuelled by Liquefied Petroleum Gas (LPG) must comply with the Liquefied Petroleum Gas Association (LPGA) Code of Practice No.18 and must not be a dual fuel system. [2.26]

Part 2 Checklist

2.1		
	filling pipe taken to deck level	☐
	filling pipe arranged to prevent fuel entering any part of the boat	☐

2.2		
	filling pipe of prescribed minimum internal diameter*	☐
	filling pipe of non-kinking material	☐
	filling pipe suitable for use with petrol	☐
	filling pipe of suitable material for use with fuel oil	☐
	filling pipe connected with leakproof joints to the top of the tank	☐
	filling pipe connected with leakproof joints to the screwcap or plate	☐
	deck filling connection outside coaming	☐
	filling pipe adequately supported	☐
	filling pipe of minimum practicable length	☐
	filling pipe joints/connections readily accessible	☐

2.3		
	deck connections minimise risk of cross contamination	☐
	deck connections clearly marked ‘PETROL’	☐
	deck connections clearly marked ‘PETROIL’	☐
	deck connections clearly marked ‘PARAFFIN’	☐
	deck connections clearly marked ‘DIESEL’	☐
	deck connections clearly marked ‘LPG BUTANE/PROPANE’	☐
	deck connections clearly marked ‘WATER’	☐
	deck connections clearly marked ‘PUMP OUT’	☐
	deck connections clearly marked ‘RINSE OUT’	☐
	deck connections are marked on deck fitting or immediately beside deck connections	☐

2.4		
	vent pipe of minimum practicable length	☐
	vent pipe fitted*	☐
	vent pipe has the prescribed minimum internal diameter	☐
	vent pipe fitted at highest point of fuel tank	☐
	vent pipe connected with leakproof joints	☐
	vent pipe of non-kinking material	☐
	vent pipe of suitable material for use with petrol	☐
	vent pipe of suitable material for use with fuel oil	☐

Part 2 Checklist - Continued

2.5		
	vent pipe extended to at least the height	☐
	equal of the deck filling connections	☐
	open end of the vent pipe fitted in a position where no danger will be incurred from escaping fuel or vapour	☐
	vent pipe fitted with an effective prescribed flame arrester	☐
	vent pipe's flame arrester mesh less than 11/linear centimetre	☐
	vent pipe's total area of gauze clear openings less than cross section of air pipe	☐

2.6		
	fuel tank properly secured	☐
	fuel tank as low as practicable	☐
	fuel tank of a suitable non-corrosive material	☐
	fuel tank sufficiently fire resistant (BS 476 Part 20)	☐
	fuel tank marked to indicate pressure test (0.25kg/cm2)*	☐
	fuel tank's joints/seams efficiently made to sustain pressure test	☐

2.7		
	petrol/paraffin tank larger than 2.5 litres is more than 1 metre from engine/heating appliances and insulated by an efficient fireproof baffle	☐

2.8		
	tube sight - not gauge glass/plastic*	☐
	fitted fuel level indicator doesn't allow escape of fuel or vapour if damaged*	☐
	fitted dipstick - calibrated*	☐
	fitted dipstick - gas tight*	☐
	dipstick - can't strike bottom of tank*	☐

2.9		
	fuel tank accessible for inspection	☐
	fuel tank connections readily accessible for inspection	☐

2.10		
	fuel tank effectively bonded to deck filling connection	☐
	fuel tank effectively bonded to an earth point	☐

2.11		
	fuel tank's drain valve suitable*	☐

Part 2 Checklist - Continued

2.12		
	fuel supply lines - connections through top, or as near as practicable to top, of tank*	☐
	gravity feed system - cock/valve fitted to tank	☐
	return fuel line - connections through top, or as near as practicable to top, of tank*	☐

2.13		
	fixed fuel pipe copper/stainless steel/aluminium alloy or for diesel	☐
	only mild steel	☐
	fuel pipe fixed clear of exhaust system	☐
	fuel pipe fixed clear of heating apparatus	☐
	fuel pipe adequately supported	☐
	balance pipe fitted only in diesel fuelled installation	☐
	balance pipe of suitable material	☐
	balance pipe fitted with valves attached to tank*	☐
	balance pipe valves constructed to remain leakproof when operated	☐

2.14		
	flexible tubing not approved outside the engine compartment	☐
	flexible tubing suitable for the fuel used	☐
	flexible tubing of a minimum practicable length	☐
	flexible tubing bore greater than half its outside diameter	☐
	flexible tubing of reinforced/fire resisting quality (BS EN ISO 7840/DIN 4798)	☐

2.15		
	fuel pipe connections permanently charged with fuel - efficient screwed/compression/cone/brazed/flanged joints	☐

2.16		
	fuel filters suitable for marine use	☐
	fuel filters of fire resistant quality	☐

2.17		
	fuel cock fitted	☐
	fuel cock fitted as near as possible to the fuel tank	☐
	fuel cock readily accessible	☐
	fuel cock location clearly marked	☐
	fuel cock immediately accessible from steering position or there are means of operating main cock from steering position	☐
	petrol cock can be opened from steering position	☐

Part 2 Checklist - Continued

2.18	
	fuel pipes installed above bilge water level ☐

2.19	
	carburettor fitted with drip tray ☐
	carburettor drip tray spirit tight ☐
	carburettor drip tray covered with copper/brass gauze ☐
	carburettor drip tray has flame arresting mesh ☐
	carburettor drip tray mesh soldered to the tray all around ☐
	carburettor drip tray removable or fitted with emptying cock ☐
	air intake fitted with flame trap or air filter ☐

2.20	
	engine securely installed ☐

2.21	
	engine - means of reversing operable from steering position* ☐
	engine stop control located as near to steering position as practicable ☐

2.22	
	engine tray made of a suitable materia ☐
	engine tray sides carried as high as practicable* ☐
	engine tray fitted beneath engine/gear box ☐
	engine tray prevents oil escaping into vessel/overboard ☐
	engine tray's fixed bilge pump fitted in oil tight area ☐

2.23	
	engine cylinders effectively cooled ☐
	exhaust system effectively cooled ☐
	exhaust pipe effectively lagged or shielded ☐

2.24	
	silencer - exhaust noise effectively suppressed ☐

2.25	
	pressure system - current pressure system certificate ☐
	boiler - current pressure system insurance policy ☐
	boiler - LPG installation complies with Part 7 of these Standards ☐
	boiler - fuel system does not complies with Part 2 of these Standards ☐

Part 2 Checklist - Continued

2.26		
	LPG engines - installation complies with LPGA Code of Practice No. 18	☐
	LPG engines - no dual fuel system	☐

All checklist items relevant to the boat's installations are mandatory passes for non-private vessels.

***EXEMPTION AVAILABLE**

Part 3
Electrical Installations

Part 3 Electrical Installations

Electrical Installations

Faulty electrics, or poorly installed electrical systems, can be a real hazard and could place you and others at risk.

The provisions of Part 3 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

This part of the Standards aims to minimise the risks from short circuits and overheating cables, both of which are a common cause of boat fires. It also addresses the potential risks of hydrogen, a highly flammable gas that is a by-product of charging your batteries.

You can reduce these risks by making sure that batteries are stowed in a ventilated area, that batteries and cables can't move around, that your fuses and circuit-breakers are correctly rated for the circuits they protect and that wear and tear hasn't left your system vulnerable to failure.

Good electrical practices can also reduce the risk of personal injury caused by electric shocks.

Batteries

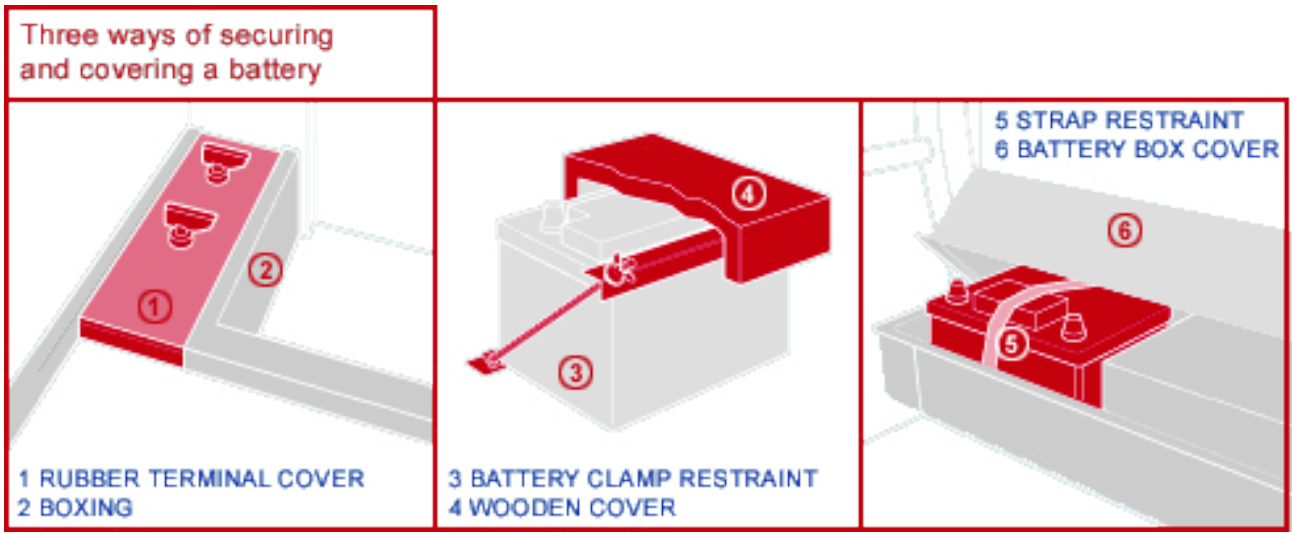
The provisions of this section of Part 3 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

To stop batteries from moving around, which could cause damage to their terminals and connections, or cause them to spill corrosive liquids over the boat, they must be securely fixed.

A source of ignition, like batteries, must be kept away from potential fuel sources to reduce the possibility of fire or explosion. So, batteries can be kept in the engine room, but they must never be under or next to a petrol or LPG tank, cylinder, stopcock, pipe or filter. It's a good idea to keep your boat's batteries at least half a metre (around 18ins) away from any petrol or LPG equipment.

If your batteries are kept in confined spaces in compartments it's essential that the build-up of flammable hydrogen gas is prevented. To achieve this, battery compartments must be properly ventilated.

To prevent sparks being created by metal objects or tools touching the top of batteries, which could act as an ignition source and start a fire or explosion, the positive and negative terminals of all batteries must have insulated covers in place. Some batteries don't have individually covered terminals, and traditional batteries have exposed connectors between the cells - in these cases you must cover the whole top surface of the battery. Covering batteries will also reduce the likelihood of electrical sparks caused by touching the terminals with a metallic object. [3.1]



Main Circuits

The provisions of this section of Part 3 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

You can help the examiner identify whether your 12 or 24 volt distribution cables are adequate to carry the current they are intended for, and that the fuses feeding each of the cables is suitable for the circuits.

Why not label each fuse with the identity of the circuit it feeds? By turning the power off you can safely disconnect each fuse in turn, before switching the main power source back on and investigating which circuit is affected. This will also help you if you have to replace a fuse in the future. Always have a cover over the fuse mounting box. [3.3]

To minimise the risk of damage to cables, and to allow a visual inspection of the installation, main circuits must be installed above bilge water level. Bilge water level can usually be determined by the presence of a 'tidemark', the position of the bilge pump or its inlet, or the level at which the float switch is set. All main circuits, other than starter circuits, must be protected by circuit breakers or fuses of the appropriate rating and of a suitable design. This means that the fuse or circuit breaker must have a rating which is lower than the current that would cause damage to the circuit. The safe operation of these devices must not be compromised by the use of thicker fuse wire or by using tape to keep the contacts closed.

If your boat has a 240V supply it's strongly recommended that you fit a residual current device (RCD) to automatically disconnect the supply. This will prevent an earth leakage current flowing through a faulty appliance, and protects someone inadvertently touching a live circuit and getting an electric shock. [3.3]

Electric Cables

Cables can overheat if the cabling on your boat is not sufficient to carry the current. To minimise this risk the cables must be capable of carrying the current and be of the right construction and grade. New electrical installations must use multi-stranded conductors, since solid conductors can easily break where there is high vibration or repeated flexing of a cable.

If solid conductor wiring is already fitted this is acceptable, as long as it's securely supported and shows no sign of wear and tear. It's a good idea to include a check on the condition of all of your boat's wiring during routine maintenance and inspection.

Fuel, water, heat, oils and other chemicals can all cause damage to your cables, reducing the effectiveness of the insulation and increasing the risk of cables overheating - which could cause them to short-circuit, spark and start a fire. Exposed 240V wiring can also give people on your boat an electric shock. To reduce these risks all cables must be properly insulated and/or sheathed with a resistant material.

To prevent damage caused by vibration, cables must be securely fixed at approximately 300mm (12ins) intervals, or run in a pipe or trunking which is adequately supported. Also, to reduce the chance of damage to the cables, they must be kept away from other heat sources such as exhaust outlets, cookers and stoves. [3.2]

Upon entering the lock a slight impact with the lock wall caused the battery to slide and the battery terminals to make contact with the metal coaming of the hull.

The hull became live. Via the engine bearers the electric current travelled along the metal braided fuel supply and return lines. Where these hoses touched, sparking occurred and the fuel hoses burnt through, allowing diesel spray to create a vicious fire. It took the fire brigade 20 minutes to extinguish the fire. [3.1] From a report detailing a serious engine compartment fire on a hired narrowboat.

Cable Installation

The provisions of this section of Part 3 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Cables should be run as high as possible to reduce the chance of heat or impact damage - at least 75mm (3ins) and ideally 125mm (5ins) away from any potential sources.

Cable conduits can be the 'clip together' uPVC type, galvanised steel or wood. But whatever the type, they must be firmly fixed at around 900mm (3ft) intervals. To minimise the chance of sparks coming off a damaged cable and igniting nearby fuels, cables must be kept at least 30mm (2ins) away from fuel and gas pipes - unless the pipe or the cable is in a suitable conduit or duct. [3.4]

Cables & Polystyrene Insulation

The provisions of this section of Part 3 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

It's a good idea to keep cables that are insulated or sheathed in PVC away from polystyrene thermal insulation - the two materials have been known to react and break down the cable covering. It's recommended that the electrical installation is periodically checked by a competent electrician - preferably every year - so that you can keep a record and spot the signs of a problem, before it becomes a potential hazard. [3.4]

Battery Master Switch

In the event of an electrical fault it's important that all power to the electrical system can be cut off so that cables and circuits do not remain live. This will enable you to control any overheating which could start a fire, allow repairs to be safely made on any blown fuse or damaged cabling and reset the tripped circuit breaker. A battery master switch or switches, capable of disconnecting the system - including the starter circuits - must be fitted in a readilyaccessible position, as close to the battery as possible.

You must be able to get at the switch without having to move anything out of the way, or use tools or keys to reach it. If you can't see the battery master switch, you must mark its position very clearly so that emergency services or other crew members can easily locate it in the event of an emergency.

The switch must be capable of carrying the maximum current of the system, including when the engine is started. If there are separate circuits connected to separate batteries, each of them must have a battery master switch. A combined switch can be used, for example in a two battery system, where one battery is used for starting the boat's engine and the other is used for domestic services.

Electrical equipment, such as bilge pumps, security alarms, fire pumps and navigation equipment - some of which may have electronic memories - can bypass the master battery switch, as long as they're protected separately by fuses or circuit breakers. This will enable them to carry on functioning safely but still disconnect in the event of a short circuit or overload fault. [3.5]

Main Starter & Spark Plug Leads

If high current capacity cable strands break as a result of flexing or vibration and then come into contact with conductive material, significant sparking can occur, which in turn can start a fire.

To reduce the risk of this happening, main and starter motor leads, which carry high currents, must have soldered or swaged connectors which will resist flexing and protect the cable strands at the terminals.

Spark plug leads must be supported so that they don't touch the engine block and cylinder head, as their insulation could become damaged by heat. This could cause them to spark and ignite nearby fuel. [3.6]

Gas Or Petrol Compartments

If you have electrical devices fitted in a compartment containing gas or petrol there's a danger of the flammable gases being ignited by hot components or electrical discharges and causing a fire or an explosion. To minimise the risk of this happening the electrical devices must be ignition-protected to meet BS EN 28846.

Boats built before 16 June 1998 are exempt from this requirement if it wouldn't be practical to comply, e.g. if the relevant component is not readily available. [3.7]

Insulated Two-Wire Systems

The provisions of this section of Part 3 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

To provide efficient circuits and minimise the risk of fire or personal injury in the event of a short circuit or power overload, all electrical equipment - except engine circuits - should be installed using a two-wire system, with one wire out from the positive and one back to the distribution box. For each circuit the positive must be connected to a fuse or circuit breaker, while the negative is taken to a common terminal connected to the battery negative and often earthed.

Some steel-hulled boats do have a one-wire system, using the hull to make the return circuit. But, as well as the risk of accidental short circuits, stray current can seriously damage the metal of the boat, and other boats in the water, contributing to hull corrosion.

Engine circuits are fitted with a low-resistance return conductor between the engine and usually the negative pole of the battery. This provides adequate protection to carry the starter current. The connections must be secure to prevent overheating and starter motor failure. [3.8]

Suppression

To reduce interference to other vital systems, such as VHF radios, all electrical equipment, including the spark ignition and generating systems of engines, must be suppressed.To reduce interference to other vital systems, such as VHF radios, all electrical equipment, including the spark ignition and generating systems of engines, must be suppressed. [3.9]

Part Three Checklist

3.1		
	battery securely installed	☐
	battery compartment adequately ventilated	☐
	battery covered with insulating and non-corrosive material	☐
	battery fitted away from petrol/lpg tank	☐
	battery fitted away from petrol/lpg cylinder	☐
	battery fitted away from petrol/lpg cock	☐
	battery fitted away from petrol/lpg pipe	☐
	battery fitted away from petrol/lpg filter	☐

3.2		
	electric cables of adequate current carrying capacity	☐
	electric cables of suitable construction	☐
	electric cables of suitable grade	☐
	electric cables insulated and/or sheathed	☐
	electric cables adequately supported in a suitable conduit	☐

3.3		
	main circuits installed above bilge water level	☐
	electric circuits protected with fuses/circuit breakers of appropriate rating	☐
	electric circuits protected with fuses/circuit breakers of appropriate design	☐

3.4		
	electric cables installed as high as possible	☐
	electric cables run clear of all sources of heat	☐
	electric cables run adjacent to fuel pipes in a suitable covering	☐
	electric cables run adjacent to gas pipes in a suitable covering	☐
	PVC cables run clear of polystyrene insulation*	☐

3.5		
	master switch installed	☐
	master switch capable of disconnecting the system	☐
	master switch readily accessible	☐
	master switch as close to the battery as possible	☐
	master switch capable of carrying maximum current	☐
	bilge pump/security alarm/fire pump/navigation	☐
	equipment circuits, which bypass the master switch, separately protected by fuses or circuit breakers	☐
	master switch position clearly marked	☐

Part Three Checklist - Continued

3.6		
	main leads fitted with soldered or pressure crimped connectors	☐
	starter motor leads fitted with soldered or pressure crimped connectors	☐
	spark plug leads supported clear of engine block/cylinder head	☐

3.7		
	electrical device fitted in petrol compartment, ignition protected*	☐
	electrical device fitted in gas compartment, ignition protected*	☐

3.8		
	electrical equipment two wire insulated	☐
	engine circuits have a low resistance return	☐
	conductor between battery and engine	☐

3.9		
	spark ignition and generating systems effectively suppressed against radio/TV interference	☐
	electrical equipment effectively suppressed against radio/TV interference	☐

All checklist items relevant to the boat's installations are mandatory passes for non-private vessels.

***EXEMPTION AVAILABLE**

Part 4
Electrically Propelled Vessels

Part 4 - Electrically Propelled Vessels

Electrically Propelled Vessels

The particular risks related to electric boats are mainly due to the presence of large banks of batteries and associated charging equipment.

Hydrogen, a highly flammable gas that is lighter than air, is the by-product of battery charging. This part of the Standards focuses mainly on minimising the risk of hydrogen causing a fire or explosion.

This can be achieved by making sure that batteries are stored securely in a ventilated area, that the propulsion motor is securely installed and that controls can be operated from the steering position. It is also important to ensure that your battery charging equipment and controller compartments are adequately ventilated.

This chapter applies to all electrically propelled boats.

Part 4 - Electrically Propelled Vessels

Electrical Installation

The provisions of this section of Part 4 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Fires can be caused by sparks igniting flammable gases or by cables overheating. To help reduce these risks it's essential that you comply with Part Three of these Standards, where applicable. It's also recommended that your electrical installation complies with the appropriate British Standards and with the Institution of Electrical Engineers (I.E.E.) Regulations for the Electrical and Electronic Equipment of Ships, where relevant. [4.1]

Part 4 - Electrically Propelled Vessels

Battery Arrangements

The provisions of this section of Part 4 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Hydrogen and air can be a very explosive mixture and especially towards the end of a charging cycle when significant quantities of hydrogen can be given off by the bank of batteries. To reduce the risk of a build-up of gas, leading to an explosion, batteries must be properly stowed and adequately ventilated. It's recommended that your battery stowage and ventilation arrangements comply with the I.E.E. Regulations for the Electrical and Electronic Equipment of Ships, where relevant. [4.2]

You might think that the weight of a big bank of batteries would keep them in a secure position.

Not so according to reports gathered from accidents. Batteries can shift around as a result of the boat tipping in a lock or at a mooring when the water level drops. It shouldn't be surprising either that unsecured batteries on your boat can move when negotiating a roundabout on the back of a trailer! [4.2]

Propulsion Motor

If electrical connections are damaged they could spark, which could ignite nearby fuel, such as Liquified Petroleum Gas. To minimise this risk the propulsion motor must be securely installed, so that its electrical connections cannot be accidentally damaged. [4.3]

Reversing

To help control whilst manoeuvring, every boat must have an effective means of reversing which can be operated from the steering position. [4.4]

Batteries must be secured in order to prevent movement and damage, which, for example, could detrimentally affect the operation of other vital systems.

By securing batteries in the proper way you can also prevent accidental battery terminal contact with conducting material, which could cause a spark. This also helps ensure that electrolyte is not spilt. [4.2]

Part 4 - Electrically Propelled Vessels

Master Switch

An electrical fault on your boat could cause sparks or overheating cables, which in turn could ignite flammable materials or gases. In the event of such a fault, you must be able to disconnect the electrical system by means of a master switch.

A manually operated master switch needs to be positioned so that it can be operated from the steering position. It must be capable of cutting off the electrical supply to the propulsion motor. [4.5]

Battery Charger Connection

The provisions of this section of Part 4 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Fires can be caused by overheated cables, which can come about if the cables don't have adequate capacity for carrying the current. To reduce the risk of this happening, the connection from the battery charger on the boat to the charging point on shore must be via a three-core flexible cable of adequate current carrying capacity and of suitable construction and grade. This will ensure the cables can carry the full electrical load continuously.

To protect the cables from water damage it's advisable to ensure that connectors comply with the splash-proof category of BS EN 60309 Part 2. Having splash-proof cable connections will greatly reduce the risk of electric shocks. [4.6]

Batteries can be secured by the battery boxes themselves if they are a rigid and a fixed part of the boat and allow no more than 10mm movement laterally.

Alternatively batteries can be secured by using a strap of insulating material to hold them down. [4.2]

Battery Charging Panel

The provisions of this section of Part 4 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

To reduce the risk of the battery charging panel overheating, it must be adequately ventilated to allow any heat produced during charging to escape. To minimise the risk of overheating cables, or short circuits, it's recommended that you fit a manually-operated switch which isolates the battery charger from the incoming a.c. supply.

It's also a good idea to have an indicator light on your charging panel that shows when the boat's batteries are charging. [4.7]

Built-in mains battery chargers must be suitable for the marine environment they are used in.

Most examiners recommend that the charger is connected to the boat via a "CEEFORM" blue 16A fixed male plug, similar to the ones used in caravans, and that the charging lead uses a "CEEFORM" free female socket on its boat end to avoid anyone's fingers coming into contact with live connectors. [4.6

Battery Charging

Hydrogen and air can be an explosive combination if ignited. Having a ventilation fan that can automatically discharge the hydrogen gas that is produced when the batteries charge can minimise this risk. If a ventilation fan is fitted it must automatically switch on when the batteries start to charge and continue to run for one hour after the battery charging cycle has been completed. [4.8]

Ventilation Of Motor & Controller Compartments

Overheating of the motor or controller compartments could cause a fire. For this reason the motor and controller compartments must be adequately ventilated. [4.9]

Part 4 - Electrically Propelled Vessels

Need More Help Or Advice On Part 4?

Contact the Electric Boat Association - https://www.electricboatassociation.org/ and refer to Standards 4.1-4.9 in the appendix F of the 2002 BSS Standards which are now only applicable to boats in Non-Private use.

Part 4 Checklist

4.1		
	electric propulsion installation complies with Part 3 of these Standards	☐
	electric propulsion installation complies with British Standards	☐
	electric propulsion installation complies with IEE Regulations	☐

4.2		
	batteries stowed in accordance with IEE Regulations	☐
	batteries adequately ventilated	☐

4.3		
	propulsion motor securely installed	☐

4.4		
	propulsion motor has an effective means of reversing	☐
	propulsion motor has an effective means of reversing operable from steering position	☐

4.5		
	master switch fitted	☐
	master switch disconnects supply to propulsion motor	☐
	master switch operable from steering position	☐

4.6		
	charging leads have 3 core flexible cable	☐
	charging leads of adequate current carrying capacity	☐
	charging leads of suitable construction and grade	☐
	charging leads splash-proof to BS EN 60309 Part 2	☐

4.7		
	charging panel adequately ventilated	☐
	charging panel has a positive switch fitted	☐
	charging panel has a warning light fitted	☐

4.8		
	battery-exhaust ventilation fan on automatic switch	☐

4.9		
	motor compartment adequately ventilated	☐
	controller compartment adequately ventilated	☐

All checklist items relevant to the boat's installations are mandatory passes for non-private vessels.

Part 5
Outboard & Portable Engines

Outboard & Portable Engines

Carrying portable petrol tanks and transferring petrol can be extremely hazardous if care isn't taken. Petrol and its vapour are highly flammable and can cause serious fires and explosions.

Other fuels bring their own risks and should be handled with equal care. This Part complements Part Two (inboard engines) and reflects the additional risks of having portable fuel systems on boats.

By ensuring that fuel doesn't enter your boat, and that all components are suitable (see fixed fuel systems for outboard/power boats and portable fuel tanks & supply lines) for the fuel used, you can minimise the risks associated with escaped fuels. Making sure portable fuel tanks and spare fuel containers are made of a suitable material, are kept in good condition and are securely stored will also reduce the risk of fuel spillage.

The following Standards apply to all boats fitted with, orcarrying, outboard or portable engines, whether or not they are in use.

The provisions of Part 5 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

TAKE NOTE

It is essential, when handling fuel or filling your fuel tanks, that you make sure there are no naked flames around. If you have any appliances on board with a lit flame or automatic ignition systems, e.g. refrigerators, cookers, central heating boilers, etc. these must always be turned off before refuelling. Always fill portable fuel tanks on shore and well away from any sources of ignition.

Fixed Fuel Systems For Outboard/Power Boats

Outboard powered craft with permanently installed fuel filling, stowage and supply systems, must comply with the relevant sections of Standards 2.1 to 2.19. You must ensure that fuel systems and all associated pipework, fuel cocks and fittings are suitably protected from external impact. [5.1/5.2]

Portable Fuel Tanks & Supply Lines

There's always the possibility of a fire starting and spreading if escaped fuel is present, while flammable vapour from petrol can cause an explosion if it's ignited.

The portable or close-coupled fuel tank must be made of a suitable material for the fuel used and maintained in a sound condition to minimise this risk. In this context a portable fuel tank is one that can be carried on and off the boat and is designed to be connected by flexible piping directly to the engine.

A close-coupled fuel tank forms an integral part of the engine. To control any accidental escape of fuel a shut-off valve must be fitted to the fuel supply line into the engine. A bayonet connection on a portable fuel tank/supply system can act as a shut-off valve.

To help prevent any of the components of the fuel supply system from failing and leaking fuel, the system must not be changed or modified in any way from that supplied or approved by the component manufacturer.

A boat fire became very serious when petrol which had escaped into the bilges was ignited.

Examiners will check that the fuel line itself is still pliable and is not showing signs of deterioration, such as cracking, which can be caused through old-age or by being in contact with the wrong fuel. It's always worth checking the condition of the fuel line on a regular maintenance basis to prevent any nasty surprises. [5.1/5.2]

One boat owner had a nasty shock on a hot and sunny day.

The petrol stored in containers on his deck was left in direct sunlight on one very hot and sunny day while the owner visited a local attraction. On his return, the boater decided to refuel his small outboard-engined boat, but forgot that vapours from the fuel would build up under pressure, because of the heat affecting the containers. When he opened the lid, petrol vapour escaped under high pressure and was ignited by what is believed to have been a discarded cigarette. The boater suffered significant burns to his arms as a result. [5.3]

To minimise the risk of putting the wrong fuel into the fuel tank, it's advisable to clearly mark your portable fuel tanks with the type of fuel they contain.

To avoid fuel and fuel vapour leaking into the boat from spare fuel tanks that are not directly connected to the engine, the tanks must be stored in accordance with Standards 7.2 through to 7.8, e.g. in a fire-resistant drained locker. This will help to ensure that any escaping fuel or fuel vapours drain overboard, rather than into the boat.

Small amounts of fuel can be diluted if they escape overboard. You should contact the Environment Agency Pollution Hotline on 0800 80 70 60 (24 hrs) or the Scottish Environment Protection Agency on 0345 73 72 71 to report instances where large quantities of fuel or other substances escape into a watercourse. [5.3]

Petrol Storage

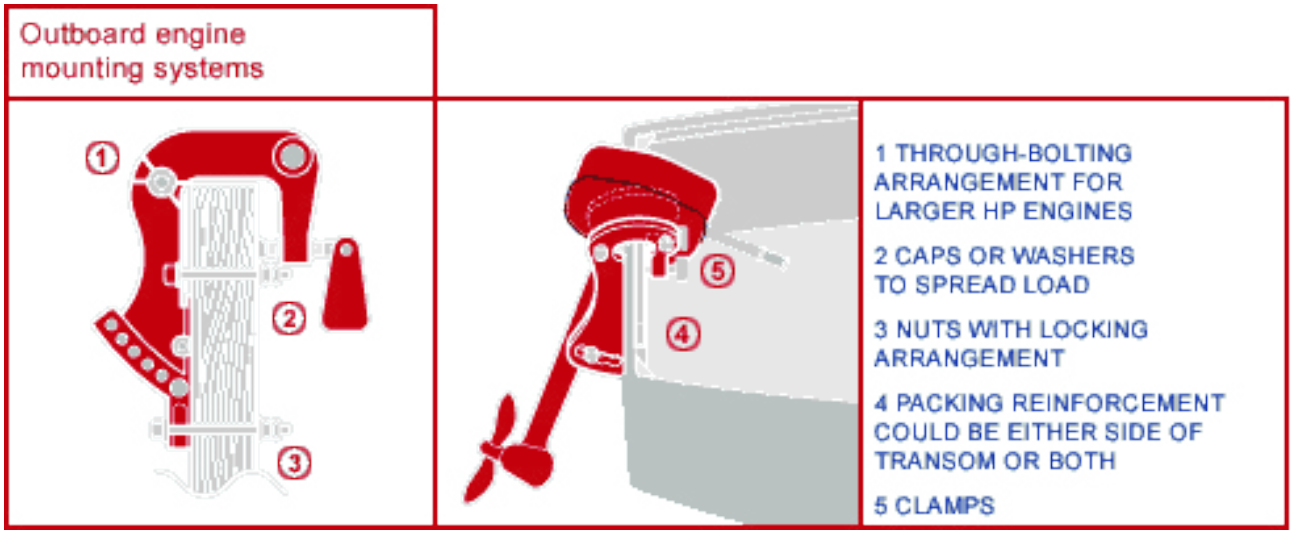
Explosions can happen if flammable vapour from petrol is ignited, and the presence of escaped fuel will always cause a fire to escalate.

Fuel containers must be made of appropriate materials to reduce the risk of leakage. The container construction must conform to the requirements of the Petroleum Spirit (Motor Vehicles, etc.) Regulations 1929 (S R & O 1929/952) or the Petroleum Spirit (Plastic Containers) Regulations S.I. 1982 No. 630.

Petrol must be treated with the utmost care at all times, and that includes ensuring that it's properly stored in a container designed for holding petrol.

When an examiner came to inspect the petrol tank on one boat he was visiting, he was horrified to find just a piece of electrical insulation tape covering a hole in a rusty and old outboard storage tank. Apart from leaking petrol each time the tank was moved, the hole also allowed dangerous vapours to escape, giving further opportunities for an explosion to occur. Don't wait for your rusty outboard tank to leak petrol before you consider replacing it, replace it now, it could prevent a fire. [5.4]

To avoid petrol leaking into the boat from fuel containers, they must be stowed in accordance with Standards 7.2 through to 7.8, e.g. in a fire resistant drained locker. This will allow fuel or fuel vapours to drain overboard, rather than into the boat. [5.4]



Lpg Outboard Engines

To minimise the potential for fire or explosion, all boats with engines fuelled by Liquefied Petroleum Gas (LPG) must comply with the Liquefied Petroleum Gas Association (LPGA) Code of Practice No. 18, and must not be a dual fuel system. [5.5]

Securing Outboard Engines

If part of your fuel supply system becomes detached it could cause fuel or fuel vapours to leak, which could spread a fire or cause an explosion. To reduce the risk of this happening outboard engines must be securely fitted. It's also worth remembering that you are in danger of losing control of your boat if the engine is not properly secured. [5.6]

Part 5 Outboard & Portable Engines

Exhaust Noise Levels

The provisions of this section of Part 5 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

It's recommended that your boat's exhaust noise is effectively suppressed to prevent noise nuisance to others. [5.7]

Storage Of Portable Internal Combustion Engines / Generators

If fuel or gas escape into your boat from your portable engine or generator there could be a serious risk of a fire or explosion.

To reduce this risk all portable LPG/petrol internal combustion engines/generators with integral fuel tanks must be stored in accordance with the requirements of Standards 7.2 through to 7.8 when they are not in use, e.g. in a fire-resistant drained locker. This will help ensure that any escaping fuel or fuel vapours drain overboard, rather than into the boat.

It's also a good idea for you to store portable diesel engines or generators securely when you're are not using them. [5.8]

When the portable tank is disconnected from the engine, it must either be stored in a fire-resistant container, stored on open deck where leakage can go straight overboard, vented near the bottom and piped overboard (similar to a steel gas compartment) or removed from the boat completely.

The same applies to petrol generators when they are disconnected from the electrical installation. You just can't take risks with petrol when an appliance is not in use. [5.8]

Part 5 Outboard & Portable Engines

Need More Help Or Advice On Part 5?

Need more help or advice? Refer to Standards 5.1-5.8 in the appendix.

For more technical information refer to:

- SRO 1929 No. 952 "The Petroleum Spirit (Motor Vehicles etc.) Regulations 1929".
- SI 1982 No. 630 "The Petroleum Spirit (Plastic Containers) Regulations 1982"

Part 5 Checklist

5.1		
	deck connections minimise risk of cross contamination	☐
	deck connections clearly marked 'PETROL'	☐
	deck connections clearly marked 'PETROIL'	☐
	deck connections clearly marked 'PARAFFIN'	☐
	deck connections clearly marked 'DIESEL'	☐
	deck connections clearly marked 'LPG BUTANE/PROPANE' as appropriate	☐
	deck connections clearly marked 'WATER'	☐
	deck connections clearly marked 'PUMP OUT'	☐
	deck connections clearly marked 'RINSE OUT'	☐
	deck connection markings on deck fitting or immediately beside deck connections	☐

5.2		
	permanent fuel systems fixed/constructed to Standards 2.1-2.19	☐
	permanent fuel systems suitably protected against external impact	☐
	fuel systems - permanent pipework suitably	☐
	protected against external impact	☐
	fuel systems - permanent fuel cocks suitably	☐
	protected against external impact	☐

5.3		
	portable/close coupled fuel tank in sound condition	☐
	fuel tank - portable/close coupled - fuel supply not capable of being readily shut off	☐
	fuel tank - portable/close coupled - unauthorised modifications made	☐
	fuel tank - portable/close coupled - not clearly marked with type of fuel used	☐
	portable fuel tank - not in use - Not stowed in accordance with Standards 7.2 and 7.3 of these Standards	☐

5.4		
	spare petrol carried in approved containers conforming to petroleum spirit regulations	☐
	spare petrol containers stowed in accordance with Standards 7.2 and 7.3 of these Standards	☐

5.5		
	LPG engines comply with LPGA code of practice No. 18 LPG Engines not dual fuel system	☐

5.6		
	outboard engine securely fitted	☐

Part 5 Checklist - Continued

5.7		
	exhaust noise effectively suppressed	☐

5.8		
	portable LPG/petrol engines generators with integral tanks stowed in accordance with standards 7.2 and 7.3 of these standardsp	☐
	portable diesel generators with integral tanks stowed in accordance with Standards 7.2 and 7.3 of these Standards	☐
	portable diesel generators stored securely	☐
	portable diesel engines stored securely	☐

All checklist items relevant to the boat's installations are mandatory passes for non-private vessels.

***EXEMPTION AVAILABLE**

Part 6
Fire Prevention & Extinguishing Equipment

Fire Prevention & Extinguishing Equipment

The provisions of Part 6 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

The main aim of this part of the Standards is to ensure your boat has suitable fire fighting equipment (see number of fire extinguishers and approval of portable fire fighting equipment) to provide an immediate response to a small fire. This will minimise the risk of a fire on your boat, or on a boat nearby, escalating out of control, and can help you and your passengers to escape safely.

Making sure that your portable fire extinguishers are properly certified, that you have a sufficient number of appropriate extinguishers and that the extinguishers are in good condition all helps. A fire blanket may provide an alternative method of extinguishing a cooking pan fire or allowing safe escape from the boat. It's also strongly recommended that your boat has two means of escape from accommodation areas.

1 April 2019 - Carbon Monoxide (CO) Alarm Requirements - section 6.4 of the Examination Checking Procedures

At least one carbon monoxide (CO) alarm is a requirement on nearly all private and non-private boats in scope of the Boat Safety Scheme (BSS) Requirements. BSS Certifications will not be issued to boats without alarms.

The requirements apply to boats with permanent accommodation, which is defined in this way:

"Space surrounded by permanent boat structure in which there is provision for any of the following activities: sleeping, cooking, eating, washing/toilet, navigation, steering. Spaces intended exclusively for storage, open cockpits with or without canvas enclosures and engine rooms are not included."

There are four new BSS Check items in the BSS examination:

Check 6.4.1 covers the provision of alarms in suitable numbers – this check ensures everyone on board can hear the alarm if it activates.

Check 6.4.2 is an Advice check for private boats, promoting a CO alarm in the same space as a solid fuel stove – stoves can present a specific risk if flue gases enter the cabin.

Check 6.4.3 requires CO alarms to be placed in open view, be of a certified quality and have a test function button – this check provides an assurance about the quality of alarm manufacture and performance.

Check 6.4.4 requires CO alarms to be in good and working condition, showing no signs of damage, being within any visible expiry dates and passing the function test using the test button – this check ensures the alarm will work effectively if called upon.

There is a handout available as an essential guide to all the new requirements and background information. It covers what is required and how the checks will be carried out by BSS Examiners and how the alarms will help keep crew members safe.

Please see following pages which inclue the handout mentioned above.

Fire Prevention & Extinguishing Equipment - Continued

CO Alarm Requirements v1.0 Mar 2019

From the 1st April 2019 a carbon monoxide alarm will be required on all boats in scope of the Boat Safety Scheme (BSS) requirements that have accommodation spaces. BSS Certifications will not be issued to boats without suitable alarms.

Carbon monoxide (CO), is produced when fuels such as petrol, coal, wood, oil, paraffin or gas don't burn efficiently, and sources include domestic appliances like heaters or cookers and engine exhaust fumes.
It cannot be seen heard, touched or felt and is so toxic it can kill in minutes while longer exposure at lower concentrations can affect peoples' physical and mental well-being.

Why do I need to be protected by a carbon monoxide alarm?
Appliances and engines on your own boat can cause CO, but you can and should take steps to stop that by having good installation, regular maintenance and using equipment as the manufacturer intended - prevention is always better than detection.

But a boat crew has no means to control or prevent CO from external sources such as the exhaust fumes of adjacent craft and nearby equipment. The only protection from outside sources of CO is a warning alarm and this is the reason why the BSS has introduced the new requirements.

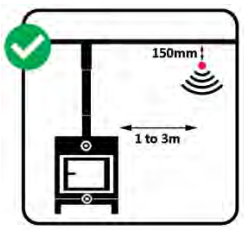
The presence of CO is a creeping danger that needs an immediate alert. People are at most risk when asleep as they may not become aware of the symptoms of carbon monoxide poisoning until it's too late.

The alarms specified in the BSS requirements are also sensitive to the lower quantities of the gas so providing a warning to the potential risk of long-term health damage.

Placing the alarms to provide the best protection - what do the CO alarm makers say?

Follow the manufacturer's installation instructions as far as the space and nature of the boat allow, to get the best protection from inside and outside sources of CO.
But if the directions are difficult to meet on your boat, follow these best practice pointers:

- In living quarters place alarms between 1m and 3m (on plan view) from appliances
- Keep alarms from being directly above a source of heat or steam
- If wall mounting an alarm, fix it high up, but at least 150mm from the ceiling and where the indicator lights can be seen
- If ceiling mounting, fix alarms at least 300mm from the cabin sides and bulkheads
- In sleeping quarters have the alarm in the "breathing zone", i.e. near the bed head
- Before fixing, test that the crew can hear an alarm from any position in the boat, or buy further alarm(s)



Fire Prevention & Extinguishing Equipment - Continued

The BSS CO Alarm Requirements - Section 6.4 BSS Examination Checking Procedures

Check 6.4.1 Do I need an alarm, or alarms, on my boat to meet the requirements?
To have the protection from the risk of outside sources of CO and to comply with the BSS Requirements, any boat that has accommodation space will need to have at least one CO alarm i.e. a cabin or other space surrounded by permanent boat structure and if that space is used for sleeping, cooking, eating, washing or steering.

Audibility is the key issue in setting the numbers of alarms needed. Boats with one open-plan space will need only one CO alarm.

However, if the boat has internal doors, then the CO alarm must be no more than 10 metres away from any door into any accommodation space. Having an alarm within 10 metres of any internal door will help ensure that an alarm activation will be audible to all onboard, wherever they are.

6.4.1R – If the vessel has one or more accommodation space(s), are the correct number of carbon monoxide alarms provided?	
Identify the presence of one or more accommodation space(s). If present, check for the presence and location of CO alarm(s). Check by visual assessment and if necessary, measure the distance between carbon monoxide alarm(s) and any door that links accommodation spaces'.	All vessels having one or more accommodation space(s) must be provided with at least one carbon monoxide alarm. A carbon monoxide alarm must be located within 10m of any door that links accommodation spaces.
Note: where there is only a single, open-plan accommodation space only one carbon monoxide alarm is required irrespective of the size of the space. **Guidance for owners**: this is a minimum safety requirement, intended to provide a warning that is audible throughout the boat, related to carbon monoxide entering the boat from outside sources. For the best protection from carbon monoxide entering the boat from sources outside and inside the boat follow the carbon monoxide alarm manufacturer's or supplier's advice about the number and placement of alarms as far as the space and nature of the boat allow. **Guidance for owners:** make sure alarms are audible to everyone aboard. More information about staying safe from carbon monoxide on boats is available at www.boatsafetyscheme.org/co.	

Owners action: test alarm audibility with your crew today.

Did you know: many makers of certified CO alarms that meet the BSS requirements, can supply accessories such as extreme loudness remote sounders, flashing lights and under-pillow vibrating pads for people with hearing loss.

Check 6.4.2. On private boats, strong advice is to have a carbon monoxide alarm in the same space as any solid fuel stove. On non-private boats, including hire boats, this is mandatory.
Because stoves produce huge amounts of CO, a faulty stove or one used with the door open, could easily flood a cabin with poisonous fumes. So, if anyone sleeps aboard and if your boat has one or more solid fuel stoves, a CO alarm within each accommodation space that contains a solid fuel stove will give protection to the boat occupants.
Although non-compliance with 6.4.2 will not stop the certification of a private boat, our advice is to meet this Check for the safety of you, your family and friends.

Fire Prevention & Extinguishing Equipment - Continued

6.4.2 A/R – If any solid fuel stoves are installed, and if the vessel has berths present within any accommodation space, is a carbon monoxide alarm provided within the same accommodation space(s) as the solid fuel stove(s)?	
Identify the presence of any solid fuel stove and whether berths are present within any accommodation space. If any solid fuel stove(s) and berths within any accommodation space(s) are present, check for the presence and location of CO alarm(s).	All vessels having one or more solid fuel stove(s) installed, and where berths are present within one or more accommodation space(s), must be provided with a CO alarm within each accommodation space that contains a solid fuel stove.
Note: the provision of a carbon monoxide alarm(s) in support of the requirement at Check 6.4.2 does not have to be in addition to the provision at Check 6.4.1. Depending on the configuration of the accommodation spaces (see 2nd requirement at Check 6.4.1) one correctly located alarm might be all that is required to comply with Checks 6.4.1 and 6.4.2.	

Check 6.4.3. Which alarm should I choose?

There are many alarms on the market and making the right choice could save your life, and that is why the BSS requires certain quality standards.

Only CO alarms marked as being certified by an accredited third-party certification body to BS EN 50291 comply.

Certification marks show an alarm has been made to an acceptable standard and provide an assurance about performance and reliability - whereas non-certified products don't. Look for the BSI and LPCB certification marks – the major, well known brands mentioned in the check have these. Combined fire and CO alarms can be accepted, but make sure the carbon monoxide element of the alarm is certified to BS EN 50291

6.4.3R – Are carbon monoxide alarms in open view and of a suitable type?	
Where one or more CO alarms have been found to be necessary at Checks 6.4.1 and/or 6.4.2, check the location of each required alarm. Check the markings on each required CO alarm. Identify the test function button on each required CO alarm.	CO alarms must be in open view with all cabin doors, cupboard doors, curtains and loose furniture etc in place CO alarms must be marked as being certified by an accredited third-party certification body to BS EN 50291 or equivalent. CO Alarms must be provided with a test-function button
Note: the main accredited third-party certification bodies in the UK are BSI and LPCB. For the following makes of carbon monoxide alarm accredited third-party certification to BS EN 50291 can be assumed – BRK, Dicon, Ei Electronics, Fire Angel, FireHawk Alarms, First Alert, Honeywell and Kidde. For other makes, removing the alarm from its base may be necessary to view labels and approval marking on the base. Permission for removal should be sought from the owner (or representative). Documentary evidence of accredited third-party certification to BS EN 50291 is acceptable. **Guidance for owners:** although not a BSS requirement, CO alarms marked to the 'BS EN 50291-2' are the best choice for boats. They have been tested to meet the more onerous conditions found in boats.	

Did you know: BS EN 50291-2 includes additional tests for vibration, shock and motion as well as covering immunity to higher levels of electrical or radio interference; all typical in boats. Sensors will be made of corrosion resistant materials suitable for use near water.

'Black-spot' colour-changing indicator cards are not a suitable alternative to CO alarms, they will not wake you if you are sleeping.

Fire Prevention & Extinguishing Equipment - Continued

Owner action: check your alarms are certified. If you require new alarms, see the list of industry-recommended CO alarms for use on boats at www.boatsafetyscheme.org

These CO alarms are readily available from chandlers to supermarkets, independent hardware high street shops, DIY chain-stores, electrical retailers, builders' merchants as well as specialist online suppliers and the major online shopping outlets.

Check 6.4.4. Looking after your carbon monoxide alarm
CO alarms usually have a life of between 7 -10 years but if your alarm gets damaged replace it without delay. Your CO alarm will have a function test button. Press the test button on your CO alarm when you first board the boat to check that it is working properly and test the alarm at least once a month when the boat is in use.

6.4.4R Are carbon monoxide alarms in good condition?	
Where one or more CO alarms have been found to be necessary at Checks 6.4.1 and/or 6.4.2, visually check the condition of each required CO alarm. Operate the test function button on each required CO alarm.	CO alarms must be in good general condition, and must not show signs of any of the following indicators of poor condition: • damage or deterioration to the body of the alarm or the fixing mechanism; • having passed any manufacturer's express replacement date; • failing the test function test.
Note: Examiners are not required to open up alarms to check for internal damage or deterioration or for manufacturer's express replacement dates.	

Owner action: consider removing the alarm from a winterised boat because long periods of sub-zero temperatures may affect its sensor and battery performance.

Owner action: boat owners are strongly recommended to remove or replace any additional CO alarms that are not in good condition and/or not independently certified. Expecting that these will work when most needed may be unrealistic and could put you and the crew at risk.

Did you know: pushing the test button proves the sensor is fully active; any analogue or digital circuitry and software are operational; the battery is healthy; and that the LEDs, display and audible sounder are functioning.

Living With Your Carbon Monoxide Alarms

What should I do if the alarm goes off?
If your CO alarm goes into alarm, open doors, windows, and awnings to allow fresh air into the boat. Turn off all fuel burning appliances, such as ovens, heaters and the engine, and get off the boat as safely as possible. Make sure you find out what the source of the problem was CO and have a qualified person fix any engine or appliance faults before using them again.

What should I do if I suspect I've been poisoned?
Owner action: understand that any of the following symptoms could be caused by CO poisoning:

Owner action: If you think you are suffering carbon monoxide poisoning, contact your doctor or if the symptoms are severe get to A&E and let them know you suspect carbon monoxide poisoning. They can do a blood or breath test to check you are ok.

Remember that CO alarms save lives never ignore them – they NEVER false alarm.
Visit boatsafetyscheme.org for more information about the symptoms of carbon monoxide poisoning and how to steer clear of danger.

Number Of Fire Extinguishers

You must have at least the minimum number of fire extinguishers relevant to the size of your boat and located near to the main fire risk points. Powered boats, or boats with cooking, heating, refrigerating or lighting appliances must be equipped with the minimum number of portable fire extinguishers according to the following table:

Boat Length	Min. Number Of Extinguishers	Min. Fire Rating Of Each Extinguisher	Min. Combined Fire Rating Extinguishers
Up to 7m (23ft)	2	5A/34B	10A/68B
7m - 11m (23-36ft)	2	5A/34B	13A/89B
Over 11m (36ft)	3	5A/34B	21A/144B

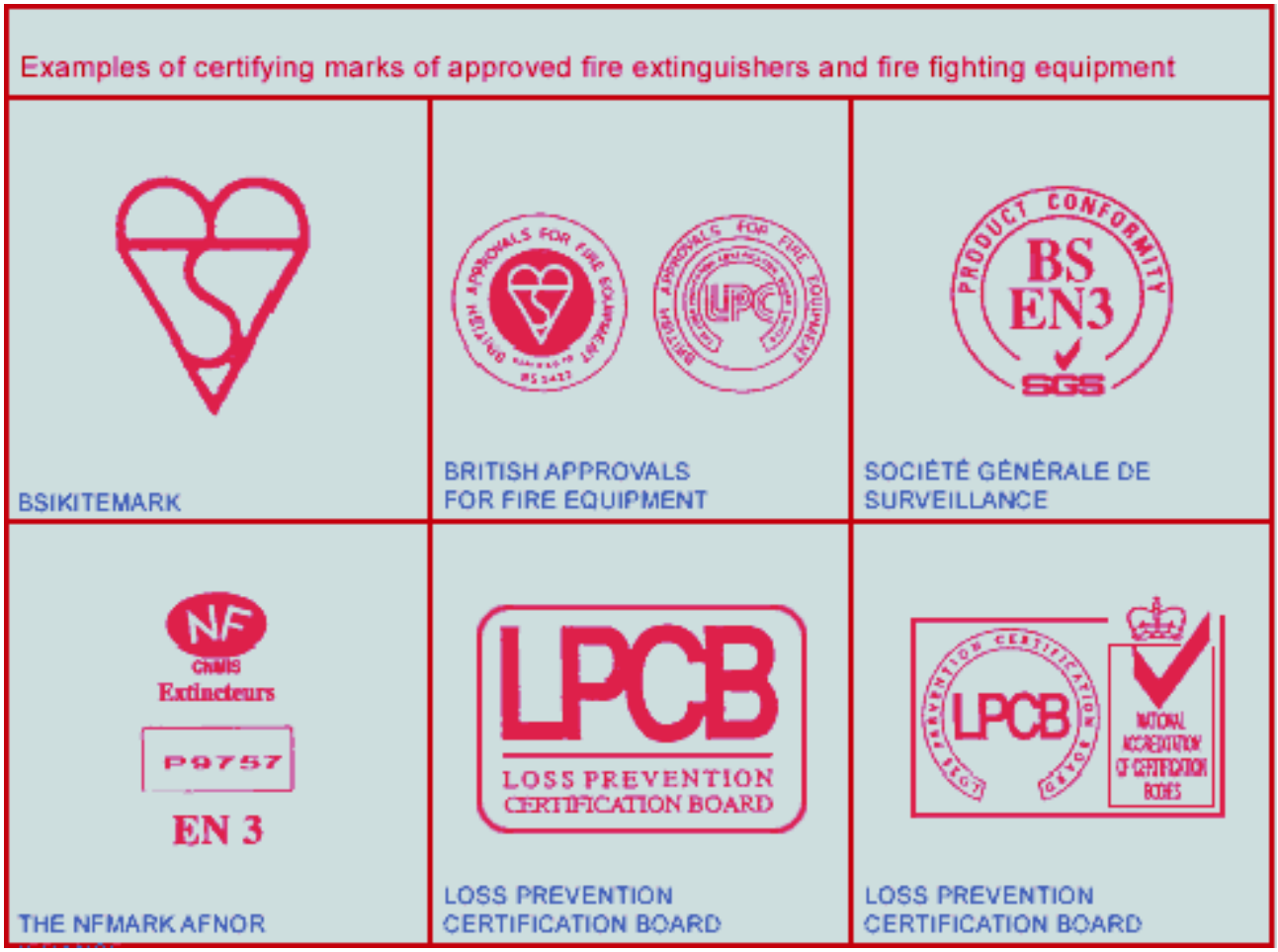
The number of extinguishers may be reduced by one 5A/34B fire extinguisher if there are no cooking, heating, refrigerating, lighting or fuel-burning appliances on the boat, or if the boat doesn't have an engine.

Extinguishers made before 16 June 1998, which comply with the navigation authorities' previous weight, number and certification requirements for fire extinguishers, are exempt from this part of this Standard concerning minimum fire rating and combined fire rating. Further information on previous weight and number requirements for extinguishers can be obtained from the Boat Safety Scheme office. [6.1]

Approval Of Portable Fire Fighting Equipment

All fire extinguishers, regardless of their age and type, must be independently verified to a high standard of manufacturing quality and performance. They must all be marked with one or more of these certifying marks:

- the BSI Kitemark
- the British Approvals of Fire Equipment (BAFE) symbol
- the Société Générale de Surveillance (SGS) symbol
- the AFNOR 'NF' shield
- the Loss Prevention Certification Board (LPCB)
- or other accredited certifying body's mark to EN3



When an examiner checks the condition of fire fighting equipment on board, here are some examples of what he's looking for which you can check on a regular basis.

Fire extinguishers must be replaced if they have missing pins, dents, perished hoses, incorrect pressure or damage to the trigger assembly. [6.1]

Approval Of Portable Fire Fighting Equipment

Fire ratings are marked on modern portable fire extinguishers, for example 5A/34B. The

The fire rating is the measure of the ability of a fire extinguisher to fight a fire of a certain size. The bigger the number in the fire rating the bigger the fire on which the extinguisher has been tested. The letter in the fire rating indicates the class of fire on which the extinguisher has been tested. The “A” rating relates to fires involving paper, wood, textiles or fabric and the “B” class fires are fuelled by flammable liquids.

Whilst in a lock an outboard engine malfunctioned and burning petrol was thrown out, over and around the rear deck area and the surrounding water.

The boat owner tried both portable fire extinguishers from the boat, however neither of them worked properly and the fire continued to burn. The owner of another boat in the lock used one of his extinguishers and the fire was put out. On inspection it was discovered that the two extinguishers originally used failed to work because they were not certified and had passed their expiry date. [6.1]

Location Of Fire Fighting Equipment

The provisions of this section of Part 6 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

In the event of an onboard fire the extinguishers must be easy to reach - they must be kept in readily accessible positions close to the main fire risk points, e.g. the engine space and the galley.

If there's a fire in the engine space and additional air is allowed into the area the fire will quickly escalate. To reduce the risk of this happening it's a good idea that any portable extinguisher used to protect the engine space is capable of being used without fully opening the primary access/engine hatch. [6.1]

Condition Of Fire Extinguishers

To ensure that your boat's fire extinguishers work effectively, they must be maintained in a good condition. It's a good idea to have them serviced annually. [6.1]

Fixed System

The provisions of this section of Part 6 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Fixed systems are counted as additional to the absolute minimum requirements for portable extinguishers. If the fixed system is remotely operated it's a good idea for the release device to be readily accessible from outside the fire risk space so that the person using it is not placed in danger. [6.2]

Fire Blanket

In boats with cooking facilities a fire blanket must be kept nearby, ready for immediate use, so that any pan fire can be dealt with swiftly and prevented from spreading. A fire blanket can also aid escape by shielding you or somebody else from the fire.

In order for the fire blanket to be effective it needs to have been made to a relevant manufacturing Standard. As a minimum the blanket must be marked as complying with the 'light duty' requirement of BS 6575, or, more recently, BS EN 1869. Blankets manufactured before the earlier Standard was introduced, in 1985, may well have deteriorated and now be ineffective in dealing with a fire. [6.3]

Make sure the fire blanket can be easily reached if there's a fire on the cooker.

Make sure the fire blanket can be easily reached if there's a fire on the cooker.

We often find blankets mounted by the side or at the back of the cooker, or in cupboards or drawers, making it dangerous to reach in the event of a cooker fire. It needs to be accessible at all times, in a safe and prominent place. Don't forget, it's also a good idea to make sure that anyone unfamiliar with the layout of your boat is made aware of where to find fire blankets, extinguishers and escape routes. [6.3]

Exposed Glass-Fibre Reinforced Plastic (Grp)

The provisions of this section of Part 6 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

On boats with hulls made of GRP, in areas of high fire risk, such as an engine room or fuel compartment, there's an increased risk of fire as a result of intense heat on the exposed GRP.

To help reduce this risk it's recommended that any exposed GRP structure on your boat is coated with suitable fire-retardant material, complying with Class 2 requirements of BS 476 Part 7. [6.4]

Polystyrene Thermal Insulation

The provisions of this section of Part 6 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

If non-fire retardant polystyrene is present on your boat this can cause a fire to escalate. To minimise the chance of this happening it's recommended that polystyrene thermal insulation complies with Type A requirements of BS 3837 Part 1. [6.5]

Soft Furnishings

The provisions of this section of Part 6 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

A cabin fire on your boat can quickly escalate if it comes into contact with flammable soft furnishings. To minimise the risk of this happening it's recommended that all soft furnishings, fabrics and foam materials used in the lining and furnishing of your boat's interior are made of fire resistant materials. Foam materials, if they catch fire, can also release noxious fumes that can injure or potentially kill a boat's passengers and crew. It's recommended that upholstery fabrics comply with cigarette and butane flame tests of BS EN 1021 Parts 1 and 2. It's recommended that suitable foams are selected which release minimum amounts of noxious products in the event of a fire. [6.6]

Two Means Of Escape

The provisions of this section of Part 6 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

If there's only one escape route from your boat and this becomes blocked by fire, you and other occupants on the boat could suffer personal injuries, burns or suffocation.

This is why it's a very good idea for all boats to have two means of escape from accommodation areas. To give sufficient space for people to fit through, and escape from the fire, it's recommended that all escape routes on your boat have a minimum clear opening of 0.2m2 (310in2) and a minimum width of 380mm (15ins). [6.7]

Have you considered how you would escape in the event of a cabin fire?

An alternative to a purpose built hatch is a suitably-sized window, but remember, if the window is not capable of being opened, a safe means to break it must be kept nearby. Always consider your escape routes and plan for the worst, even if you may never need to use them. It's better to be safe than sorry! [6.7]

Need More Help Or Advice On Part 6?

Refer to Standards 6.1 - 6.7 in the appendix. For more technical information refer to:

- BS EN ISO 9094 - 1 “Fire Protection - Part 1: Craft with a hull length of up to and including 15m”.
- BS EN ISO 9094 - 2 “Fire Protection - Part 1: Craft with a hull length of over 15m and up to 24m”.
- Statutory Instrument SI 1998 No. 1011:
  The Merchant Shipping (Fire Protection: Small Ships) Regulations 1998

Part Six Checklist

6.1		
	fire extinguishers of an approved type	☐
	fire extinguishers readily accessible	☐
	fire extinguishers near fire risk points	☐
	fire extinguishers maintained in good condition	☐
	fire extinguishers above minimum (individual) fire rating*	☐
	fire extinguishers above minimum combined fire rating*	☐
	required number of fire extinguishers*	☐
	portable fire extinguisher capable of discharge into engine space, without fully opening primary access	☐

6.2		
	fire extinguisher fixed system - remote release device readily accessible from outside risk space	☐

6.3		
	fire blanket required and fitted	☐
	fire blanket fitted at least to 'light duty' BS 6575*	☐
	fire blanket ready for immediate use	☐
	fire blanket kept near to cooking facilities	☐

6.4		
	exposed GRP - fire retardant complies with Class 2 BS 476 Part 7*	☐

6.5		
	thermal Insulation - complies with Type A BS 3837 Part 1*	☐

6.6		
	soft furnishings/fabrics/foam material of suitable fire resistant/non-toxic material *	☐
	upholstery fabric test to Standards of BS EN 1021 Parts 1 and 2*	☐

6.7		
	no two means of escape from accommodation areas*	☐
	means of escape - opening not of minimum dimensions*	☐

All checklist items relevant to the boat's installations are mandatory passes for non-private vessels

***EXEMPTION AVAILABLE**

Part 7
LPG Installations

LPG Installations

LPG (Liquefied Petroleum Gas) is kept under pressure as a liquid and when released becomes a highly flammable gas that is much heavier than air. The aim of this part of the Standards is to minimise the risk of this gas escaping into your boat's interior, where it could quickly accumulate, creating an explosive 'mix' of gas and air.

This chapter concentrates on how best to store LPG, how to supply your gas appliances and how to protect the gas system and installation from heat and impact damage.

Having main shut-off valves and appliance isolation valves to control the LPG supply, and keeping the gas system away from sources of ignition will help to reduce the risks.

Any fitter engaged in work on LPG systems on boats in scope of the Gas Safety Installation and Use Regulations must be **Gas Safe** registered.

Soundness

To ensure that your LPG system is sound and leak-free there must be a means of adequately testing your gas system. There are a number of ways this can be done:

- having a readily accessible built-in test point on appliances where a test gauge can be attached, without using tools to dismantle any part of the appliance
- by having a readily accessible approved test point fitted in the pipework
- by having a bubble tester installed in the cylinder locker - this has the added advantage that you will be able to regularly and easily check the system for leaks yourself.

Information regarding the tests which can check the soundness of a gas system can be found in BS 5482-3. [7.22]

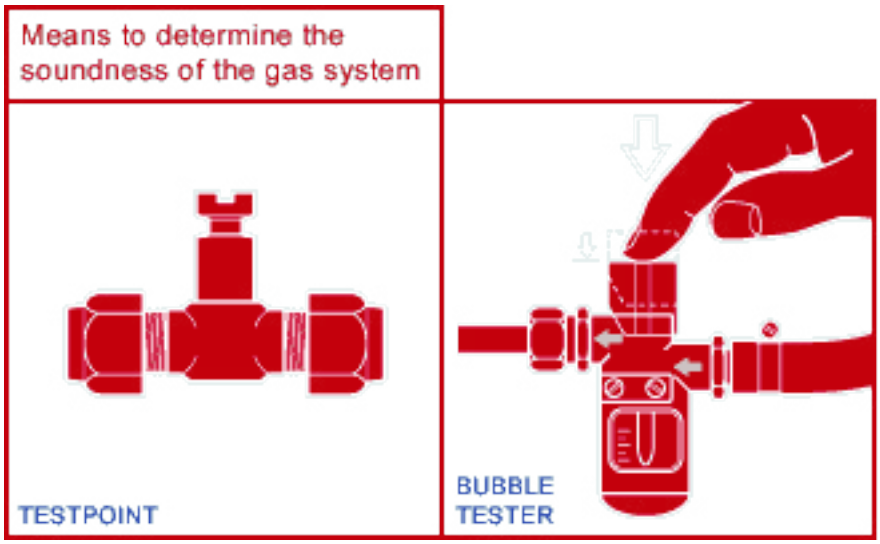
Appliance Isolation Valve – Numbering & Design

To help ensure effective use of isolation valves it's recommended that those which are not immediately adjacent to appliances should be clearly marked to the appliance they serve.

For ease of use if valves operate by rotation it's recommended that they are closed by turning clockwise. It's also a good idea to mark the 'open' and 'closed' positions on or next to each of the valves on your boat.

Using unsuitable valves can allow gas to leak. Plug valves must be springloaded and needle valves must not be used.

Accidentally switching a valve on could lead to an unnoticed accumulation of gas. To help prevent this happening, valves at floor level must be located so they can't be inadvertently activated, or they must be of the drop fan or loose key type.



If pipework is not sealed effectively from appliances which have been permanently removed or temporarily removed for servicing, gas will leak. To prevent this from happening, pipework to such appliances must be properly plugged or capped. Isolation valves alone are not sufficient for this purpose. [7.21]

Appliance Isolation Valves

Appliance isolation valves must be installed in the supply line to each appliance, including portable types. This allows an appliance to be isolated from the main installation system if it leaks or malfunctions.

To ensure that you can easily control the gas supply to each appliance the valves must be readily accessible. Boats manufactured before 3 January 2000 are exempt from this part of this Standard, unless the appliance is connected with a flexible hose.

If there is only one appliance the main shut-off valve is sufficient, unless the appliance is portable. [7.20]

Joints

Inefficient joints will cause LPG to leak.

To minimise the risk of this happening joints must be made with compression fittings. Soldered joints must not be used because of their low resistance to heat, such as that experienced in an initial fire. For stainless steel and copper alloy pipework, screwed fittings are acceptable. To enable them to be checked regularly all joints must be readily accessible. Vibration can cause joints to become loose. To help prevent this, joints must be rigidly supported and fixing clips must be attached no more than 150mm (6ins) from each joint connection.

Pipes which enter joints at abnormal angles and do not provide an efficient connection may leak over time. To reduce the risk of this happening, joints must be made at a point where stress is minimised. All joints and other pipe connections are potential failure points in a LPG gas installation system. To reduce the risk of leaks the number of joints must be kept to a minimum. [7.19]

Installation Pipework 2

Installation pipework must be fixed away from, or insulated against, electricity or telecommunication services and must not pass through the same duct as these other systems. It must be separated from uncovered electrical cables by at least 30mm (1.2ins).

It's also recommended that installation pipework does not pass through ventilation or air conditioning ducts located on your boat.

Deterioration of pipework could occur if it's subjected to water damage. To reduce the chance of this happening it's a good idea to keep pipework away from water services.

The effect of heat on pipework can cause it to expand and contract, which can lead to a hardening of the pipework or loose joints, which in turn could allow gas to escape. To help prevent this happening, installation pipework must be positioned at least 75mm (3ins) away from exhaust pipes or other sources of heat. [7.18]

Pipe Routing

If installation pipework becomes water damaged it may leak. To help prevent this from happening the pipework must not run below bilge water level. Bilge water level can be determined by the presence of a 'tidemark', the position of the bilge pump or its inlet, or the level at which the float switch is set.

This will also protect it from other mechanical damage and allow you to smell a leak more easily if one occurs.

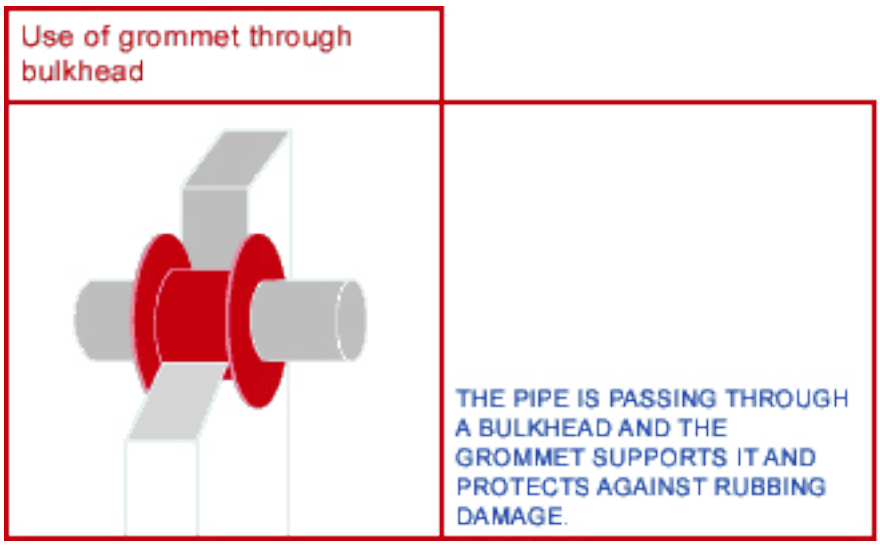
LPG pipework must be kept away from areas containing sources of ignition such as petrol-engine spaces and battery compartments. If, however, the pipework has no joints, and is enclosed in a gasproof conduit, it may be run through these spaces. [7.17]

Installation Of Pipework

It's important that all parts of the gas system installation pipework on your boat are accessible for routine examination, service and replacement. Pipework that can't be examined may hide damage.

To help LPG work efficiently, and to minimise the amount of pipework that is prone to damage, it's recommended that the installation pipework is run as short as possible, particularly between the cylinder(s) and the highest rated appliance(s). However, a longer run of pipe is acceptable if this reduces the likelihood of the pipe being accidentally damaged.

To protect pipework from potential mechanical damage which could cause it to leak, it must be run as high as possible within the hull, preferably at or above gunwhale level. Leaking pipework is easier to detect at this height since LPG sinks and may not be noticed if escaping from pipework situated at floor level. Fractured pipework or loose connections will leak. To ensure that the effects of vibration don't cause pipes to fracture, or the connections to loosen, the pipework must be rigidly secured with fixing clips spaced at approximately no more than 500mm (20ins) apart.



To reduce the possibility of abrasion to the pipework, it must be protected from damage where it penetrates bulkheads or walls, by the use of sleeves, grommets or bulkhead fittings. [7.16]

Self-Contained Portable Gas Appliances

Self-contained portable gas appliances, which have the burner screwed direct to the cylinder or container, such as a camping stove or lamp, have the potential to leak sufficient amounts of LPG into the interior of a boat to create an explosive 'mix'. To minimise the risk of this happening you must store these types of appliances in a cylinder locker or cylinder housing when they're not in use.

There's a real risk of this type of appliance leaking gas or tipping over whilst in use. These appliances must be closely supervised at all times and empty cylinders safely disposed of. [7.15]

Portable Appliances

By definition a portable appliance is readily transportable. Movement of an appliance can put a strain on installation pipework and fittings, potentially leading to gas leaks. To reduce the risk of these happening, flexible hose must be used to connect the appliance with the installation pipework.

All flexible hoses, if not pre-manufactured, must be fixed to hose nozzles and not straight onto copper pipe.

Hoses clipped to pipework without nozzles tend to leak past the joint as the hose ages, presenting a serious risk to you and those around you. [7.13]

The method of connection between a portable appliance and the gas isolation valve must allow for the regular connection and disconnection of the gas supply, whilst minimising the risk of any leak. To help achieve this, flexible hoses must be connected to the isolation valve by means of a bayonet, plug-in or screwed connection. Bayonet and plug-in connections have a secondary means of closing off the gas supply. If a screwed connection is used a secondary means of shutting of the gas supply must be provided on your boat, i.e. it must be properly plugged or capped when the appliance is not connected. [7.14]

Flexible Hose

Flexible hose must be made of a suitable material otherwise it will rapidly deteriorate and fail. To minimise the risk of this happening all flexible gas hose must conform to one of the following

Regarding low-pressure hoses either

- BS 3212 type 2; or,
- BS EN 16436 Class 2 / Class 3; or,
- BS EN 1763-1 Class 2 / Class 3; or,
- BS EN 1763-2 Class 2 / Class 3

Regarding high-pressure hoses either

- BS 3212 type 2; or,
- BS EN 16436 Class 3; or,
- BS EN 1763-1 Class 2 / Class 3; or,
- BS EN 1763-2 Class 2 / Class 3

As all flexible gas hose has a limited life it is important to minimise the amount that is used on your boat. Hose must therefore be of minimum practicable length and not exceed 1m (3ft 3ins).

It's recommended that hoses are inspected regularly to check that they are still in good condition, i.e. no brittleness, flaws, cracking, abrasion, or kinking, as all these things could lead to failure. For this reason flexible hose used on your boat must be readily accessible so it can be easily checked.

To prevent damage from abrasion and deterioration, flexible hoses must be installed without stress or tight radius turns. Hose passing through bulkheads, partitions, deck heads or decks must also be protected from abrasion.

Loose hose connections may also be a source of gas leaks. To reduce the risk of these happening proper clamps, that are not likely to loosen over time, must be used. For low pressure applications, flexible hose must either be a pre-assembled length fitted with integral threaded metallic ends, or alternatively must be secured to nozzles by a metal crimped clamp or worm drive hose clamp. Hose clamps fixed by spring tension must not be used. Oversized or undersized hose clamp connections could cause gas leaks. To prevent these from happening hose clips and clamps must be of the correct size for the hose and at least 8mm (0.3ins) in width. Flexible hose must not be used where it could be subjected to temperatures above 50°C. [7.13]

After enjoying an evening's fishing from their small cabin cruiser, two friends called it a night when the gas ran out in their camping lantern.

One of them removed the gas cartridge from the lantern and discarded it into the cabin's waste bin. The next morning one of the men lit up a cigarette and there was an explosion, leading to both men being hospitalised. The explosion was caused by ignition of the residual gas in the lantern cartridge leaking out throughout the night, and because the gas is heavier than air, it had no means of escape from the confines of the boat. [7.15]

Installation Pipework 1

Installation pipework made of unsuitable materials may fail, leading to gas leaks. Installation pipework must be made of either of the following:

- seamless copper tube which conforms to BS EN 1057 with copper or
- copper alloy compression fittings
- stainless steel tube or copper nickel alloy of a grade suitable for use with LPG in a marine environment with appropriate compression or screwed fittings.

Flexible hose can be used to connect the installation pipework to a gimballed cooking appliance, or a domestic cooker or refrigerator, that needs to be moved for cleaning. A gimballed appliance is one which is fixed on swinging mounts, allowing it to compensate for the boat's movement. If a flexible hose is used it must conform to Type 2 of BS 3212.

If there's only a single cooking appliance installed on your boat, flexible hose can be used to connect it directly to the low pressure regulator. As flexible hose can and will deteriorate in time, its use must be kept to a minimum and its individual length should not exceed 1m (3ft 3ins). [7.12]

Connection To Installation Pipework

The inlet gas connection is the point at which the installation pipework begins.

Where cylinders are stowed in cylinder lockers or housings the inlet gas connection must be situated inside the locker or housing, as this will help prevent damage to it leading to a leak inside your boat. The inlet gas connection must also be securely fixed to help prevent damage and must be readily accessible so that it can be inspected for security and checked for leaks.

If there are holes in the cylinder locker this could allow leaked gas to escape into the boat and if this gas is ignited it could then explode or start a fire. To ensure this doesn't happen, installation pipework from cylinder lockers must either be from a bulkhead fitting or above the level of the cylinder, low pressure regulator and associated equipment. [7.11]

High Pressure Stage Components

All gas fittings and components between the cylinder and the input side of the gas regulator (which is there to reduce the output pressure of the bottled gas) are classed as the 'high pressure' side of the gas system. Damage here could cause a very rapid and significant burst of gas to escape.

To reduce the chances of this gas reaching the interior of your boat these high pressure components must be installed in one of the following locations:

- on the open deck
- cabin top
- outside the cockpit
- in a cylinder locker
- in a cylinder housing.

Where two or more cylinders are connected, each high pressure connection must be protected by a non-return valve. This will prevent a high pressure leak occurring when one of the two cylinders is disconnected.

It may not always be obvious whether you have a non-return valve. Most automatic changeover devices will have them, some double wall blocks incorporate them and some pigtails are supplied with them. If you have any doubts about this please consult a gas professional or contact the BSS officee.

If a high pressure LPG hose breaks or leaks this could flood your boat with LPG, even if that side of the system is kept on deck or in a locker. To minimise the risk of this happening high pressure components, which are not directly attached to the cylinder valve, must be connected by a pre-assembled length of flexible hose conforming to either...

- BS 3212 type 2; or,
- BS EN 16436 Class 3; or,
- BS EN 1763-1 Class 2 / Class 3; or,
- BS EN 1763-2 Class 2 / Class 3

and must be fitted with integral threaded metallic ends. You can always check with the BSS office. To allow for the replacement of cylinders the flexible hose must be of the minimum practical length and not exceed 1m (3ft 3ins).

High pressure components, e.g. the regulator, that are not directly attached to the cylinder valve must be secured in a position that provides protection from mechanical damage and protects vent holes from getting debris or water in them. Your LPG appliances operate within a certain pressure band and above this level the flame on an appliance may roar and lift off, which could ignite nearby fuel or vapour. Below this level the appliance burner may go out, allowing gas to leak into your boat. To minimise the risk of either of these things happening, regulators with a manual pressure adjustment facility must not be fitted. This will prevent LPG at incorect pressures from reaching appliances.

Regulators do not last forever and the British Standard BS 5482-3 recommends that regulators more than ten years old should be replaced. [7.10]

Risk Of Damage In Cylinder Lockers & Housings

To help prevent impact damage to gas components, and to maintain an unobstructed drain pipe, you must not keep any items which could damage gas components or block the drain in the gas housing or cylinder locker. Sources of ignition must not be kept in the locker either, for obvious reasons! [7.8]

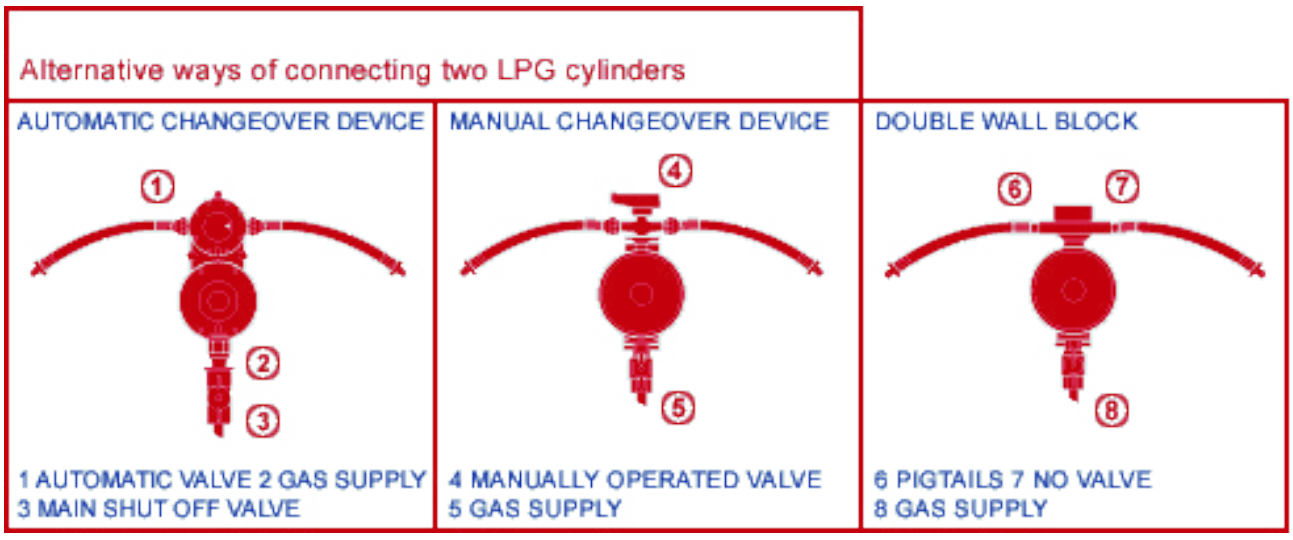
Main Shut-Off Valve

In the event of a gas leak it's essential that the LPG supply can be quickly and easily shut off. To help ensure this, a readily accessible main shut-off valve, situated outside the accommodation space, must be fitted as close to the LPG cylinders as possible.

Boats manufactured before 3 January 2000 that were designed and constructed with a cylinder locker within the accommodation space are not required to comply with the above part of this Standard.

To ensure that the LPG supply can be cut off in an effective way, the valve of any LPG cylinder or of a connected low pressure regulator can be used as the main shut-off valve. If there are two or more LPG cylinders connected by an automatic changeover device, the main shut-off valve must be situated as close to its outlet as practical.

If the shut-off valve can't be found quickly and easily by people unfamiliar with your boat - for instance, friends or emergency staff - they will not be able to use it in an emergency. If any valves aren't visible, or if any are hidden by doors or lids, their positions on your boat must be clearly marked. This applies to all main LPG shut-off valves, and each valve must indicate where other valves can be found on your boat. [7.9]



The cylinder locker containing the cylinders and main shut-off valve can be locked when the boat and gas installation are not in use and are turned off, as long as the location of the main shut-off valve is clearly marked.

When the boat is in use, ready access to the main shut-off valve is important and the locker must be kept unlocked and fully accessible at all times. [7.9]

Lpg Cylinders In Self-Draining Cockpits

Boats with a cylinder housing that opens into properly designed and constructed self-draining cockpits are acceptable provided:

- the drain outlets from the self-draining cockpit are above the waterline when the boat is fully loaded
- the self-draining cockpit is LPG-tight to the interior of the boat, at least to the height of the LPG cylinders, low pressure regulators and associated equipment
- any hatches or openings within the self-draining cockpit are watertight
- cylinder housings conform to the draining requirements of Standard 7.2 and Standards 7.3, 7.4, 7.5, 7.6 and 7.8.

This will help to minimise the risk of gas leaking into your boat's interior. [7.7]

Whilst cooking dinner the gas cylinder ran out and so the valve on the second connected cylinder was opened to finish cooking the meal.

The next morning the skipper noticed that the main battery voltage was slightly lower than usual, and so decided to start the small diesel generator situated in a storage locker at the aft end of the boat. At the second attempt to start the generator an explosion occurred that destroyed the aft end of the boat and caused the skipper to lose his left leg. An investigation concluded that the valve on the second gas cylinder had not been correctly tightened, causing LPG to leak into the gas locker. Unfortunately the gas locker had allowed gas to pass to the bilges through holes in the locker where incorrectly installed pipework and cylinder securing arrangements penetrated the locker walls. [7.4]

Cylinder Locker/Housing Opening

In order to easily use the valves, remove the cylinders and access the connections or regulating devices it's recommended that the opening into your cylinder locker or cylinder housing is sufficiently large.

If cylinder lockers are in high risk areas and they leak near sources of ignition, this could potentially cause a fire or explosion. To help prevent this happening the opening into a cylinder locker must not be situated in an accommodation space, engine space, fuel tank space or battery space. Boats manufactured before 3 January 2000 that were designed and constructed with a cylinder locker within the hull of the vessel, but outside engine, fuel tank, or battery spaces, are exempt from this part of the Standard. [7.6]

Cylinder Locker/Housing Drains

If the drain pipe material or connections deteriorate this could cause LPG to enter the boat and subsequently cause an explosion or fire. To minimise the risk of this happening cylinder locker or housing drain pipes, hoses and connections must be made of a suitable material for use with LPG. (Hose conforming to ISO 7840 is acceptable for this purpose). It should also be noted that any drain hose will only have a limited life. They should be regularly checked and, if necessary, replaced. (See also Check List item 7.13)

To help ensure that a drain is effective it must have an internal diameter of a sufficient size - this must be at least 19mm (3/4ins). For boats manufactured before 3 January 2000, which carry no more than 15kg of gas, this diameter may be 12mm (1/2ins) - enlarged proportionally for additional gas storage. If flexible hose is used as the drain pipe it must be connected to the cylinder locker or housing and the hull fitting in accordance with Check List item 7.13, which specifies the types of gas connections which must be used. [7.5]

Cylinder Locker/Housing Construction

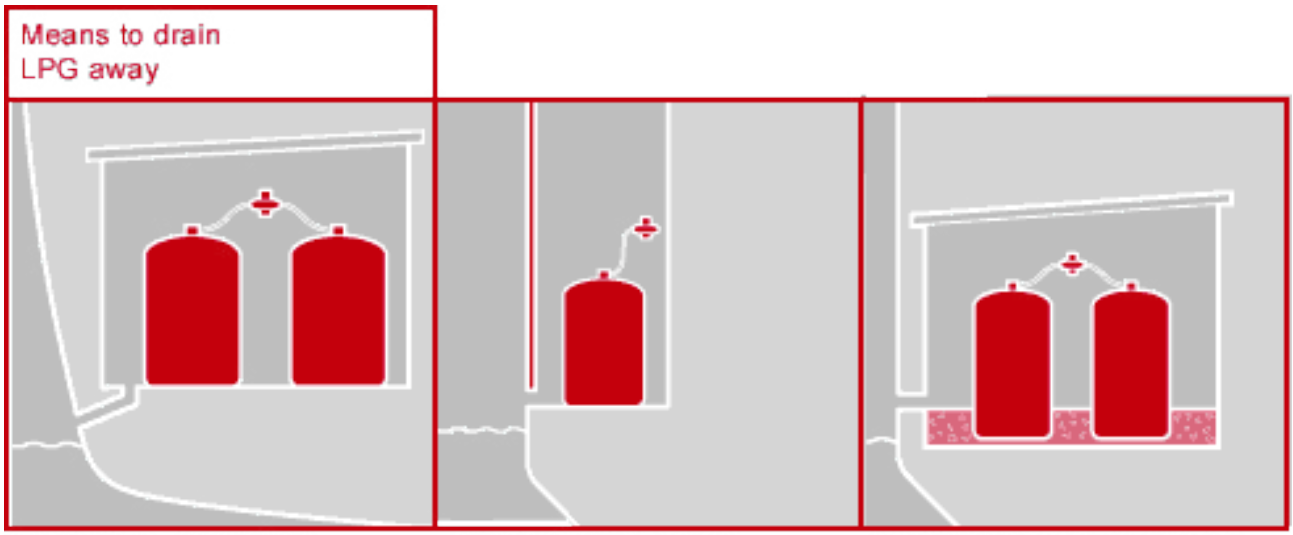
Some protection against gas cylinders overheating can be achieved by ensuring that any gas cylinder locker or housing has a fire resistance of 30 minutes. There are several accepted ways of achieving this fire resistance for cylinder lockers or cylinder housings:

- they must be constructed of metal at least 0.9mm (0.03ins) thick, with continuously welded or brazed joints
- they must be made of fibre reinforced plastics (FRP) of minimum thickness 5mm (0.2ins)
- they must be made of materials with a fire resistance of 30 minutes, in accordance with BS 476-20. [7.4]

Stowage Of Lpg Cylinders

Gas cylinders are designed to be stored and operated in an upright position with their 'on cylinder' valve uppermost. To help prevent damage and leaks they must only be kept and used in this way.

If cylinders and their associated pipework and fittings can move about too much, those fittings, valves or regulators can quickly become damaged and leak. To reduce the risk of this happening, cylinders and their lockers must be securely stowed.



It's recommended that cylinders, cylinder lockers or cylinder housings do not obstruct people moving around the deck or walkway, or interfere with the normal and safe operation of your boat.

Cylinders are designed to release excess pressure that can build up if they're exposed to extreme heat. Under these circumstances, gas can quickly find its way into the interior of your boat presenting a significant and immediate risk of fire or explosion. To minimise the risk of this happening cylinders, cylinder lockers or cylinder housings must not be located near to heat sources. In the event of a fire on board, which causes the cylinders to overheat, an explosion could occur or the cylinder could jet gas onto a fire, causing it to escalate. To give you, or the emergency services, a chance to get to the cylinders to remove them they must be readily accessible and movable. [7.3]

For existing boats, cylinders can be stowed on brackets or shelves fixed to the outside face of the transom but this is not recommended best safety practice.

In these circumstances the cylinders, regulators and associated pipework have to be protected from damage in the event of collision, and be ventilated to allow any escaping gas to flow directly overboard. [7.3]

Part 7 - LPG Installations

Location Of Lpg Cylinders

If LPG cylinders or their valves or fittings are damaged and gas leaks into your boat's interior there is a risk of it being ignited and causing a fire or explosion. To reduce the risk of this happening every cylinder (full or empty, stored or in use) must be properly secured on open deck or in a suitable cylinder locker:

Either on decks, cabin tops or outside cockpits:

- They must either be stored on open deck, cabin tops or outside cockpits, as long as any leaking LPG can drain overboard.
- They must be at least 1m (3ft 3ins) away from hatches, other openings into the boat and possible sources of ignition.
- Cylinders, low pressure regulators and associated equipment can be enclosed in a shelter on open cabin tops or outside of cockpits, as long as any escaping gas can flow overboard and not into the confines of the boat.

Or, for cylinder lockers:

- Cylinders can be secured in a suitable cylinder locker, which must be gas tight to the height of the regulator and valve. To help keep the lockers gas tight they must be designed to only open from the top.
- Cylinder valves, regulators and other components in the lockers can be damaged if boating equipment, such as mooring pins, are thrown in. Damaged gas components could quickly leak, leading to a serious fire or explosion potentially. To minimise the risk of this happening cylinder lockers must have a lid or cover to protect the cylinders, low pressure regulators and associated equipment from mechanical damage.
- To prevent gas, which has escaped in the cylinder locker, from entering the interior of the boat LPG must be able to drain effectively from the lowest point of the cylinder locker to a point outside the hull, above the waterline. Boats manufactured before 3 January 2000, which have a cylinder locker drain as near as practical to the bottom of the cylinder locker, are exempt from this part of this Standard. [7.2]

Completion Of Lpg Installation Testing

All LPG installations must meet the testing requirements of BS 5482 Part 3, in so far as they cover gas soundness, flue spillage and burner flame pattern requirements. Meeting these requirements will minimise the risks of gas leaks into your boat and the build-up of combustion products which may be toxic to you and your crew. All of these tests must be completed by the BSS examiner during the examination, where applicable, and it's very important to remember that your boat must have sufficient quantities of gas and water and an adequate supply of electricity on board in order for these to take place. [7.1]

Part 7 - LPG Installations

Part Seven Checklist

7.1		
	LPG installation installed to BS 5482-3	☐

7.2		
	LPG cylinders on open deck - leaking gas can flow overboard	☐
	LPG cylinders on open deck - at least 1 metre from hatches or other openings	☐
	LPG cylinders on open deck - at least 1 metre from source of ignition	☐
	LPG cylinders not on open deck - in cylinder locker	☐
	cylinder locker - LPG-tight to hull interior to height prescribed	☐
	cylinder locker - openable only from the top	☐
	cylinder locker - provided with a lid or cover as prescribed	☐
	cylinder locker - provision for ventilation above the level of the cylinders*	☐
	cylinder locker/housing - provision to drain leaked LPG from lowest point of locker or housing*	☐

7.3		
	stowage of LPG cylinders - installed in upright position with valve uppermost	☐
	stowage of LPG cylinders - secured to prevent damage	☐
	stowage of LPG cylinders - cylinder locker or housing doesn't form an obstruction	☐
	cylinder or cylinder locker/housing located away from heat source	☐
	LPG cylinders accessible and removable in an emergency	☐

7.4		
	cylinder locker/housing fire resistant for 30 mins to BS 476-20	☐
	cylinder locker/housing if metal, joints fully welded or brazed	☐

7.5		
	cylinder locker/housing drains - materials of drain pipes, hoses and connections suitable for use with LPGy	☐
	cylinder locker/housing drain hoses - connections in accordance with standard 7.13	☐
	cylinder locker/housing drains at least 19mm internal diameter*	☐

7.6		
	cylinder locker/housing opening enables specified functions	☐
	cylinder locker opening not situated in accommodation/engine/fuel or battery space*	☐

7.7		
	LPG cylinder in self-draining cockpit - in a cylinder locker or housing	☐
	LPG cylinder housing in self-draining cockpit - outlets above deepest loaded waterline	☐
	LPG cylinders housing in self-draining cockpit - hatches or openings watertight	☐

Part Seven Checklist - Continued

7.8		
	cylinder locker/housing does not contain items that could damage regulator(s) or pipework	☐
	cylinder locker/housing does not contain items that could obstruct the drain	☐
	cylinder locker/housing does not contain items that could ignite leaking LPG	☐

7.9		
	main shut-off valve fitted outside accommodation space*	☐
	main shut-off valve readily accessible	☐
	main shut-off valve located as close to cylinder(s) as practicable	☐
	main shut-off valve - LPG cylinder or regulator valve is not used as main shut-off valve if there is an automatic changeover device	☐
	main shut-off valve located as close to the automatic changeover device as practicable	☐
	main shut-off valve clearly visible and position clearly marked location of other main shut-off valves marked on or adjacent to each valve	☐

7.10		
	high pressure stage components installed on open deck or, if there is one, in a cylinder locker or cylinder housing	☐
	two or more cylinders connected - non-return valve fitted in each high pressure stage connection	☐
	high pressure stage components directly attached to cylinder	☐
	valve are connected by pre-assembled flexible hose such that... “ ...high-pressure hoses – complies with either: • *BS 3212/2; or,* • *BS EN 16436 Class 3; or,* • *BS EN 1763-1 Class 2 or Class 3; or,* • *BS EN 1763-2 Class 2 or Class 3*	☐
	...low pressure hoses – complies with either: “ • *BS 3212/2; or,* • *BS EN 16436 Class 2 or Class 3; or,* • *BS EN 1763-1 Class 2 or Class 3; or,* • *BS EN 1763-2 Class 2 or Class 3*	☐
	high pressure stage components directly attached to cylinder valve are protected as specified	☐
	low pressure regulator - not external manual-adjustment type fitted	☐

7.11		
	inlet gas connection securely fixed	☐
	inlet gas connection below decks or in cockpits are situated in a cylinder locker or housing	☐
	installation pipework from locker from bulkhead fitting or above the specified level	☐

Part Seven Checklist - Continued

7.12		
	installation pipework is seamless copper, stainless steel or copper nickel alloy	☐
	flexible hose connector used only on gimballed cooking appliance or on an appliance requiring movement for hygienic purposes	☐
	single cooking appliance installation with flexible hose connection does not exceed 1 metre	☐

7.13		
	flexible hose conforms with either:	
	LOW pressure - " • *BS 3212 type 2; or,* • *BS EN 16436 Class 3; or,* • *BS EN 1763-1 Class 2 / Class 3; or,* • *BS EN 1763-2 Class 2 or Class 3*	☐
	HIGH pressure - " • *BS 3212 type 2; or,* • *BS EN 16436 Class 3; or,* • *BS EN 1763-1 Class 2 / Class 3; or,* • *BS EN 1763-2 Class 2 or Class 3*	☐
	flexible hose of minimum practicable length - does not exceed 1 metre	☐
	flexible hose readily accessible	☐
	flexible hose not installed under stress or with tight radius turns	☐
	flexible hose protected from abrasion through bulkheads, partitions, deck-heads or decks	
	flexible hose in low pressure applications connected as specified hose clamps not fixed by spring tension	☐
	hose clips & clamps of correct size for hose	☐
	flexible hose not used where temperature could exceed 50oC	☐

7.14		
	portable appliance - connector to isolation valve fitted with bayonet, plug-in or screwed connection	☐
	portable appliance isolation valve - screwed connection properly plugged or capped when appliance not connected	☐

7.15		
	self-contained portable appliance stored in cylinder locker or housing	☐

Part Seven Checklist - Continued

7.16		
	installation pipework accessible	☐
	installation pipework as short as practicable	☐
	installation pipework as high as practicable within the hull	☐
	installation pipework rigidly secured	☐
	installation pipework routed or protected to minimise possibility of damage	☐
	installation pipework protected where it penetrates bulkheads	☐

7.17		
	installation pipework situated above bilge water level	☐
	installation pipework not in contact with material that could cause corrosion	☐
	installation pipework in jointless in gas-proof conduit through petrol engine space	☐
	installation pipework jointless in gas-proof conduit through space dedicated	☐

7.18		
	installation pipework does not pass through ventilation or air conditioning duct	☐
	installation pipework not exposed to leakage from water services	☐
	installation pipework does not pass through same duct as electricity or telecommunications services	☐
	installation pipework separated by at least 30mm from electric cables and in a conduit	☐
	installation pipework situated at least 75mm from exhaust pipes	☐

7.19		
	joints made as specified	☐
	joints readily accessible	☐
	joints rigidly secured	☐
	joints made where stress minimised	☐
	joints kept to a minimum	☐

7.20		
	appliance isolation valves installed in supply line to each appliance where more than one appliance is installed*	☐
	portable appliance isolation valves installed	☐
	appliance isolation valves readily accessible	☐

Part Seven Checklist - Continued

7.21		
	appliance isolation valves immediately adjacent to appliance, and appliance served is indicated	☐
	appliance isolation valves operated by rotation are closed by clockwise rotation	☐
	appliance isolation valves open and closed positions clearly marked on or adjacent to valve	☐
	appliance isolation valves - tapered plug valve is spring loaded	☐
	appliance isolation valves - needle valve installed	☐
	appliance isolation valves located at floor level to prevent inadvertent operation, and of a drop fan or loose key type	☐
	appliance permanently removed and supply pipework properly plugged or capped	☐

7.22		
	means to determine soundness - fitted	☐
	soundness of LPG installation - no leaks in system	☐

All checklist items relevant to the boat's installations are mandatory passes for non-private vessels.

***EXEMPTION AVAILABLE**

Part 8
Appliances, Flueing & Ventilation

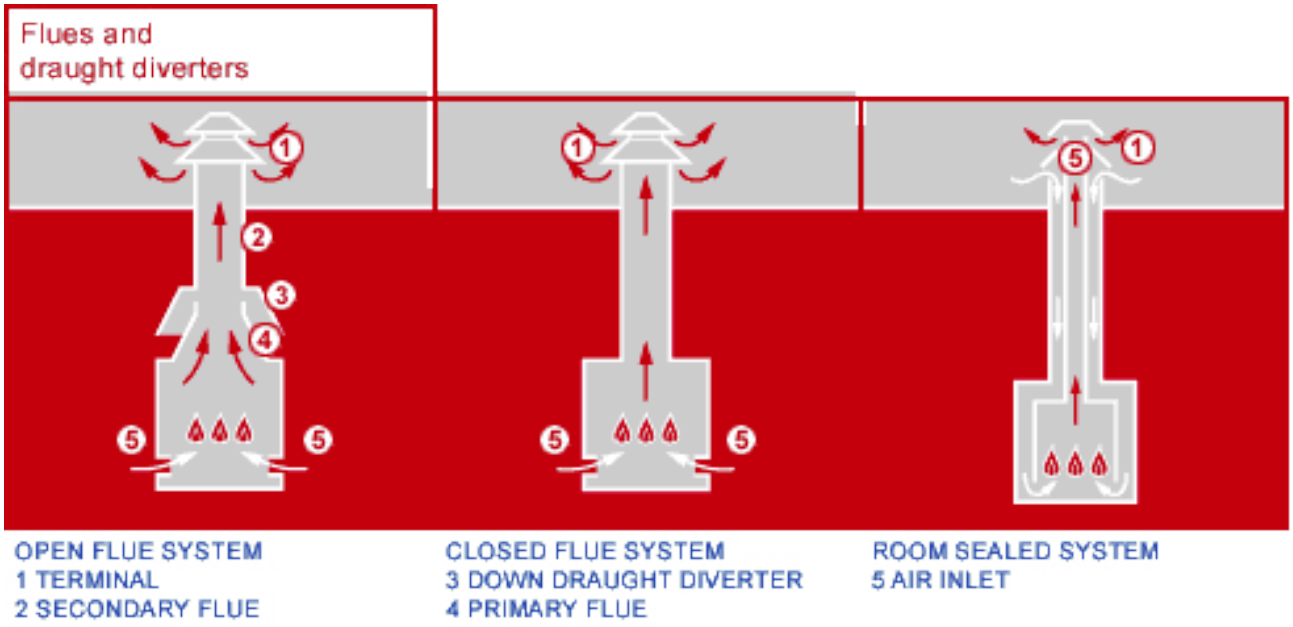
Appliances, Flueing & Ventilation

Cooking, heating, refrigerating and lighting appliances could all ignite or fuel a fire on your boat. The aim of this Part is to minimise the risk of fire and explosion caused by leaked fuel or overheating surfaces or materials. It also aims to control potential sources of ignition, such as pilot lights.

The provisions of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Making sure appliances can automatically cut off the fuel supply if the flame fails, and that appliances with naked flames are turned off and automatic ignition systems disabled before taking fuel onboard, particularly petrol, will help reduce the risks of a fire or explosion.

Inadequate ventilation has been the cause of avoidable and tragic accidents on board boats and incomplete or inefficient combustion of gas, solid or liquid fuels can lead to a lethal build-up of carbon monoxide. You can help prevent this by making sure appliances and their fuel supplies are properly installed and serviced and the by-products of combustion are safely dispersed (see flue components, room-sealed appliances and ventilation) to the outside environment.



There is a growing recognition of the risks associated with the use of non room-sealed gas appliances when used in confined spaces such as boats. These risks include poisoning and suffocation to individuals on board from improperly flued and ventilated appliances. So new LPG appliances must be room sealed, except where room-sealing is not physically possible, i.e. cooking appliances.

There is one specific exception to this rule and this is for LPG instantaneous water heaters. Based on the good previous safety record of these particular appliances, and until such a time as a room-sealed direct replacement becomes easily available, British Waterways and the Environment Agency accept the continued installation of instantaneous water heaters on private boats. If you are changing your non-room sealed instantaneous water heater it's strongly recommended that you consider room sealed alternatives.

Appliances, Flueing & Ventilation - Continued

The production of carbon monoxide at low rates over a period of time can lead to dangerous accumulations of this noxious gas in enclosed spaces. For this reason appliances which operate for extended periods, and particularly during the night, must either be fitted with effective devices which automatically turn them off if carbon monoxide is detected or be of a room-sealed type. The risk from older appliances of carbon monoxide poisoning is so great that it's intended to prohibit the installation and use of non room-sealed refrigerators or central heating appliances on inland waterways boats after 1 January 2006. When buying an appliance it is a good idea to make sure that it's suitable for use in your boat. Manufacturers may provide an assurance of suitability by any of the following means:

- installation instructions include a section specific to boats
- brochures and other literature aimed at the boat-owner market
- conformity with relevant published Standards.

Whilst there is no requirement in these Standards to prove the design purpose of any appliance, general checks regarding damage, deterioration and specific checks on the materials used will help identify inappropriate equipment. Don't forget, if your appliance is not working safely and effectively, you could be putting yourself and others on your boat at great risk.

Part 8 - Appliances, Flueing & Ventilation

Fuel Installation

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

The principles that apply to the storage and supply of fuels and the potential sources of ignition are also covered in this Guide. These principles can be applied to the fitting of most domestic appliances on boats. The fire risk is the same and as such all fuel arrangements must comply with any other relevant parts of these Standards. [8.1]

Existing Non Room-Sealed Lpg Appliances

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Appliances which are not room-sealed but which were installed before 3 January 2000 can continue to be used, as long as they are serviceable and in good condition.

Replacement and additional new appliances to the boat must be of the roomsealed type, except for cooking appliances and, in the absence of a direct replacement, instantaneous water heaters.

To help ensure continued safe operation of an appliance any modifications or additions to an existing appliance must be performed in accordance with the manufacturer's guidelines. Defective or inappropriate components could lead to a gas leak or inefficient combustion and the production of noxious gases. [8.2]

Lpg Or Paraffin Refrigerators On Boats With Petrol Engines

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

There have been numerous explosions resulting from the use of gas refrigerators with naked flames on petrol-powered boats. The low level permanent flame of a pilot light or burner could be the prime source of ignition for any stray petrol fuel or vapour. To prevent this happening the pilot lights and burners on LPG or paraffin refrigerators installed in boats with a petrol engine must be completely enclosed by a suitable flame trap.

When starting to re-fuel, a flash explosion occurred that blew out the cabin windows and injured a woman, though fortunately no fire started.

It was determined that even with the petrol pump nozzle fully inserted into the deck fuel connection, sufficient petrol vapour was produced to rise over the 175mm coaming, travel along the cockpit floor and into the cabin to be ignited by the permanent low-level burner flame on a LPG fridge. Before starting to fill, the pump attendant had asked specifically if any appliances were operating on board and was told “no”. [8.2]

Combustion air and combustion products must be drawn and expelled through a suitable flame trap. Alternatively, combustion air can be piped to the appliance from outside the vessel, or from a point inside the vessel above the level of any opening to the outside air. [8.2]

Catalytic Heaters

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Catalytic heaters must conform to BS 5258-11 or BS EN 449. This will ensure that the heater is provided with suitable safety devices to prevent unburned gas from being released into the cabin. [8.2]

A water heater is classed as a single point appliance when the hot water outlet is connected to only one hot tap (and not a shower outlet).

An identical water heater is classed as a multi-point appliance if it is connected to a number of hot taps, some of which can be showers. So, a single-point water heater serving only a sink top does not need to be flued to the outside (although it is always a very good idea to do this). On the other hand, a multi-point heater or a heater supplying a shower must always be flued to the outside, to ensure that noxious gases can be safely expelled outside the boat. [8.2]

Part 8 - Appliances, Flueing & Ventilation

Flues & Draught Diverters

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Appliances needing a flues include:

- instantaneous water heaters, supplying a bath or shower
- instantaneous water heaters installed in confined spaces
- instantaneous water heaters which serve more than one hot water outlet
- solid fuel appliances
- any appliance which is fitted with a flue spigot.

Defective or inappropriate flues can cause a build up of combustion byproducts, which may lead to **carbon monoxide poisoning**. To help prevent this from happening and to ensure the continued safe operation of your appliance; flues and draught diverters fitted to it should be of a type approved by the manufacturer and properly fitted and maintained.

In any case, flues must be made of suitable material, be maintained in good condition and be effectively insulated to prevent nearby combustible materials from being damaged or set alight.

A flue spillage test to check the effectiveness of flues will be carried out as part of the examination. Information about the test can be found in BS 5482-3. Insufficient gas pressure can cause the burner flame on an appliance to go out, causing gas to leak into your boat, which in turn can ignite and start a fire or explosion.

To minimise the risk of this happening you must make sure that sufficient gas pressure is available to all the appliances. This can be assessed by ensuring that a satisfactory flame is present at all burners when all burners are lit and fully open. The examiner will do a flame pattern assesment to test this. [8.2]

Part 8 - Appliances, Flueing & Ventilation

Installation

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Some appliances are just not suitable for use on boats, e.g. where they generate too much heat in a confined space or where they are heavy and unstable. If surfaces next to an appliance get overheated there is a danger that they could catch fire. To reduce the risk of this happening you must make sure that all appliances are suitable for use on your boat, situated in sufficient space and are properly installed in line with the manufacturer's instructions for installation on boats.

Gas appliances can be connected with flexible pipes if the appliance is portable (e.g. can be moved for cleaning purposes).

The hose needs to be fitted with an isolating tap on the feed side of the hose (to each appliance). Even though it is connected via a hose, the appliance must still be secured. Another situation where a hose is permitted is if the final connection to, say, a built-in hob unit over an oven unit, could not be made with fixed pipework because of difficulty accessing the joints. [8.3]

The installation instructions for appliances which were already in place before 3 January 2000 may not be available. Where woodwork and all other combustible materials, including curtains, are close to these appliances they are acceptable provided there is no damage evident. In general, woodwork and combustible materials which are not inherently flame retardant must be suitably insulated, protected against excessive heat or treated with a durable flame retardant.

To prevent damage to gas pipes and flue joints you must make sure that all appliances are secured against accidental movement and connected in such a way that undue stress on pipework or fittings is prevented.

Petrol vapour mixed with air is very explosive and steps must be taken to reduce the risk of it becoming ignited by an appliance burner. LPG and fuel oil appliances therefore must not be installed in petrol engine spaces. [8.3]

Installation Of Cooking Appliances

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Cooking appliances carry the risk of large open flames at the burners and there are specific requirements to prevent fires and explosions occurring. If there is a collision and your cooking appliance is knocked over or damaged this could cause a leak in the pipework. To minimise the risk of this happening, cooking appliances (including those with gimbals - swinging mounts) must be firmly secured. It's a good idea for gimballed cooking appliances to be secure at all angles of heel.

Smoke was spotted coming out of a galley cupboard, next to a solid fuel stove that was lit.

The internal timber framework of the cupboard was alight, and a serious situation was only just averted by the quick thinking owner who extinguished the fire. The heat from the solid fuel stove had transferred from the stove through the tiled surface approximately 75mm away and onto the timber framework of the galley unit beneath the tiles. Had the smoke not been noticed so quickly, the consequences of this incident would certainly have been much worse. [8.3]

In the event of a fire at the cooker, nearby surfaces could also catch light and spread the fire. To reduce the risk of this happening, materials near cooking appliances must be non-combustible or protected against the spread of flame to Class 1 of BS 476-7.

It's recommended that there is a gap of at least 25mm (1ins) between an appliance and any surface which is likely to reach 50oC or above. Laminated plastic, e.g. 'Formica', can be accepted as a fire retardant when fixed in a vertical position.

Combustible materials, and materials without a Class 1 surface 'spread of flame' rating, must not be placed within the specified distances of cooking appliances. Cooking appliances in place before 3 January 2000 do not have to meet the distance requirements provided that there are no signs of heat damage to any woodwork or other combustible materials, including curtains near to them. [8.4]

Flame Supervision Device (Fsd)

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

If the burner on any of your appliances goes out and the fuel continues to flow and is ignited this could start a fire or cause an explosion. To reduce the risk of this happening appliance burners, ignition burners and pilot lights must be fitted with flame supervision devices that completely and automatically close off the LPG or fuel oil supply if the flame goes out.

Appliances in good condition and in place before 3 January 2000 are exempt from this requirement, as long as a flame supervision device is fitted to catalytic heaters, appliances with a pilot light (e.g. instantaneous water heaters) or those which normally have a continuous flame (e.g. refrigerators.) [8.5]

Water Inlet

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

To minimise the risk of scalding, the water inlet to any instantaneous water heater must be piped only from your boat's cold water system. [8.6]

Fuel Oil Appliance

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

The intensity of a fire could be increased if the flow of fuel oil can't easily and safely be stopped in the event of an emergency. To help reduce the risk of a fire escalating, fuel oil appliances must have a valve or cock to shut off the fuel supply. This must also be in a readily accessible position, which is at a safe distance from the appliance. [8.7]

Flue Components, Room-Sealed Appliances

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Defective or inappropriate flue ductwork serving room-sealed appliances could cause a build-up of noxious gases, e.g. **carbon monoxide**. To minimise this risk flue components, including ductwork and terminals on room sealed appliances, must be installed according to the manufacturer's instructions.

Some flues are fabricated from corrugated and relatively thin material which is susceptible to damage if it isn't properly installed.

To minimise the risk of flue gases re-entering a boat, flue terminals and air inlets should not be positioned within 500mm (20ins) of ventilators, opening ports, hatches, or windows. There is also a risk that flammable vapours could be drawn down into an appliance and for this reason the same separation of flue terminals/air inlets from re-fuelling fittings or fuel tank vent outlets is recommended.

Flue terminals should also be outside areas that could be enclosed by your boat's canopies. This will help ensure that combustion gases are safely released from the boat.

Making sure that terminals are sufficiently robust to prevent accidental damage to them and located where the risk of accidental damage is low will also help prevent combustion gases building up inside your boat. [8.8]

Part 8 - Appliances, Flueing & Ventilation

Ventilation

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Adequate ventilation is essential for personal health and safety and for the correct and efficient operation of oxygen consuming appliances.

Room-sealed appliances have their own air supply built into the flue ductwork, but other appliances take their combustion air supply directly from the cabin space.

Insufficient ventilation can lead to the production of **carbon monoxide**, which is highly poisonous. The responsibility for the safety of the occupants on board lies with the boat's owner and on non-private boats, adequate fixed ventilation is required where LPG or other fuel-burning appliances are used that draw air from the accomodation space.

The recommended amount of ventilation depends on the number and type of appliances on board in accordance with the formula from British Standard Code of Practice PD 5482-3 i.e:

minimum effective area (mm2) = [2200xU]+[650xP]+[440xF] Where: U = total input rating (kW) for all appliances (including cookers) without flues F = input rating (kW) for all open or closed flue appliances P = number of people for which the compartment is designed

The input rating for your appliances can normally be found on the manufacturer's plate on the appliance and/or in the operating instructions. The ventilation requirements then need to be split equally between:

- high level (ideally cabin roof) and
- as low as practicable.

Low level venting can be achieved by letting in cold air from vents in doors and/or bulkheads, or by means of ducting from a higher level.

Ventilators should be fixed open on boats which are exclusively used on inland waterways, however boats which go out to sea and are likely to experience severe weather conditions may have ventilators that can be closed for weathertightness. Where closable ventilators are used on your boat it's a good idea to make use of a warning notice close to every appliance, e.g. "Warning - open ventilator(s) before use". [8.9]

Warning Notices And Warning Labels

The provisions of this section of Part 8 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

As a result of some of the tests and checks carried out for Parts Seven & Eight of these Standards during the BSS examination, your examiner may conclude that continued use of an appliance, or other gas safety issues, could place you, your friends or family at risk. In order to allow you to make an informed decision about the situation he, or she, may issue you with a BSS Warning Notice.

This warning notice alone is advisory warning you as the owner and anyone entering the vessel that they could be at risk.

Should the warning relate to the discovery of a gas leak in the system, this is considered to be immediately dangerous and the examiner will take action to make the gas system safe by attaching a tag to the gas system and taping the master valve or by removing the gas bottles to a safe place.

The navigation authority responsible for the relevant waterway will be informed of any dangerous boat so that appropriate actions can be considered.

Part Eight Checklist

8.1		
	fuel installation in accordance with appropriate parts of these Standards	☐

8.2		
	non-cooking LPG appliance room-sealed*$	☐
	non-room sealed, non-cooking appliance installed before specified date*$	☐
	modifications or additions made after the date specified comply with appliance manufacturer's recommendations	☐
	gas or paraffin refrigerator in a petrol-engined boat pilot light/burner completely enclosed	☐
	gas or paraffin refrigerator in a petrol-engined boat combustion	☐
	air and combustion products exhausted as specified	☐
	gas or paraffin refrigerator in a vessel with a petrol-engined boat - combustion air piped as specified	☐
	catalytic appliance complies with BS 5258-11 or BS EN 449	☐
	flue/draught diverter an approved type	☐
	flue/draught diverter properly fitted and maintained	☐
	flue of suitable materials	☐
	flue effectively insulated	☐
	flue ensures safe transfer of gases to outside of boat	☐
	flue/draught diverter fitted to fuel burning appliance which requires one	☐
	test fitting on appliance*	☐
	burner flame picture satisfactory	☐

8.3		
	appliances properly installed*	☐
	appliance secured	☐
	appliance connections avoid undue stress on pipework & fittings	☐
	LPG/fuel oil appliance not installed in petrol engine space	☐

8.4		
	gimballed cooking appliances secure at all angles of heel	☐
	combustible materials in vicinity of cooking appliance are protected as specified	☐
	combustible & unprotected materials are specified distance from cooking appliance*	☐
	curtains located 600mm away from cooking appliance*	☐

8.5		
	flame supervision device fitted to appliance burners, ignition burners and pilot lights	☐

Part 8 - Appliances, Flueing & Ventilation

Part Eight Checklist

8.6		
	water inlet to instantaneous water heater piped directly from cold water supply	☐

8.7		
	fuel oil appliance has shut-off valve/cock	☐
	fuel oil appliance - shut-off valve/cock readily accessible	☐
	fuel oil appliance - shut-off valve/cock within same compartment	☐
	fuel oil appliance - shut-off valve/cock at safe distance	☐

8.8		
	flue components properly installed	☐
	flue terminal/air inlet positioned at least 500mm from specified locations	☐
	flue/flue terminal ensures safe transfer of gases to outside the boat	☐
	flue terminal outside the boat, away from area that could be enclosed by canopies	☐
	flue terminal in a position that minimises risk of damage	☐

8.9		
	fixed ventilation in accordance with PD 5482-3	☐
	fixed ventilation warning notice displayed as specified	☐

All checklist items relevant to the boat's installations are mandatory passes for non-private vessels

***EXEMPTION AVAILABLE**

$INSTANTANEOUS WATER HEATERS ARE ALLOWED BUT NOT RECOMMENDED

Part 9
Pollutiuon

Part 9 - Pollution

Pollution

There is an ever-growing interest in improving our waterways environment and some suggestions that boats can be a potential threat to water quality.

This part of the Standards aims to ensure that our waterways are kept clean and pollution-free.

The provisions of Part 9 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Pollution

The provisions of this section of Part 9 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Any sewage discharge into a watercourse is offensive and is usually illegal. To minimise the risk of a boat's toilet system creating pollution, it is recommended that toilet systems that discharge human waste directly into the water can be sealed off.

Sealing a toilet system can usually be achieved by either sealing the sea-cock in a closed position or by fixing heavy-duty tape over the bowl or lid of the appliance. To minimise pollution, and the risk of the holding tank imploding, it is recommended that the toilet system is constructed to a recognised Standard, i.e. BS EN ISO 8099.

If large quantities of fuel or other substances escape into a watercourse you should contact the Environment Agency Pollution Hotline on 0800 80 70 60 (24hrs) or the Scottish Environment Protection Agency on 0345 73 72 71. [9.1]

Owners of boats based in, or visiting, an inland waterway are advised to check with the relevant navigation authority concerning any restriction in place in respect of sea toilets capable of discharging directly overboard.

Examiners are not required to render sea toilets inoperable, however some navigation authorities require owners to inform them of the presence of sea toilets.

Part 9 - Pollution

Part Nine Checklist

9.1		
	sanitation system - capable of being sealed or rendered inoperable	☐
	sanitation system complies with BS MA 101*	☐

All checklist items relevant to the boat's installations are mandatory passes for non-private vessels.

***EXEMPTION AVAILABLE**

Part 10
Non-Private Boats & Safety Features

Non-Private Boats & Safety Features

This Part of the BSS Standards addresses such risks as falling overboard, sinking and personal injury. The Standards and associated Check List items shown here are mandatory for hire boats and public passenger craft carrying less than twelve people.

Hire boat operators must apply all of the following Check List items.

However since each of these represents best safety practice it is strongly recommended that all private boat owners follow them too.

Part 10 - Non-Private Boats & Safety Features

Handrails

To reduce the risk of someone on your boat falling overboard it's recommended that privately-owned boats have effective handrails fitted where there are walkways.

They are mandatory for non-private boats.

To work properly the handrails must be of sufficient length - where practical the full length of cabin tops - and of adequate strength. Alternatively, guard rails may be fitted around the perimeter of the deck. [10.2]

Life-Buoy

This standard [10.1] is mandatory for non-private boats to help rescue someone who has fallen into the water.

It's also recommended that privately owned boats carry at least one life-buoy, in a readily accessible position, so that it can be used immediately. [10.1]

After passing a boat coming from the opposite direction, a boater was horrified to turn around and see one of the crew lose his balance and fall overboard.

Quickly knocking the engine into neutral, the boater grabbed his life-buoy and threw it directly at the man overboard. Unfortunately the man didn't see the life-buoy coming, and as a result was knocked unconscious when the life ring hit him. Always shout a warning when throwing a life-buoy, and always make sure it is thrown to one side of the person in the water. [10.1]

Water Intakes

The provisions of this section of Part 10 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

An effective valve or cock fitted in water intake pipes can reduce the risk of the boat sinking if the pipe is damaged in some way. It's a good idea to fit these to all skin hull fittings that are below the water line when the boat is normally loaded, since they allow you to quickly isolate any water intakes. [10.4]

Any openings in the hull must be at least 250mm above the normal laden water line.

Any openings in the hull must be at least 250mm above the normal laden water line.

Part 10 - Non-Private Boats & Safety Features

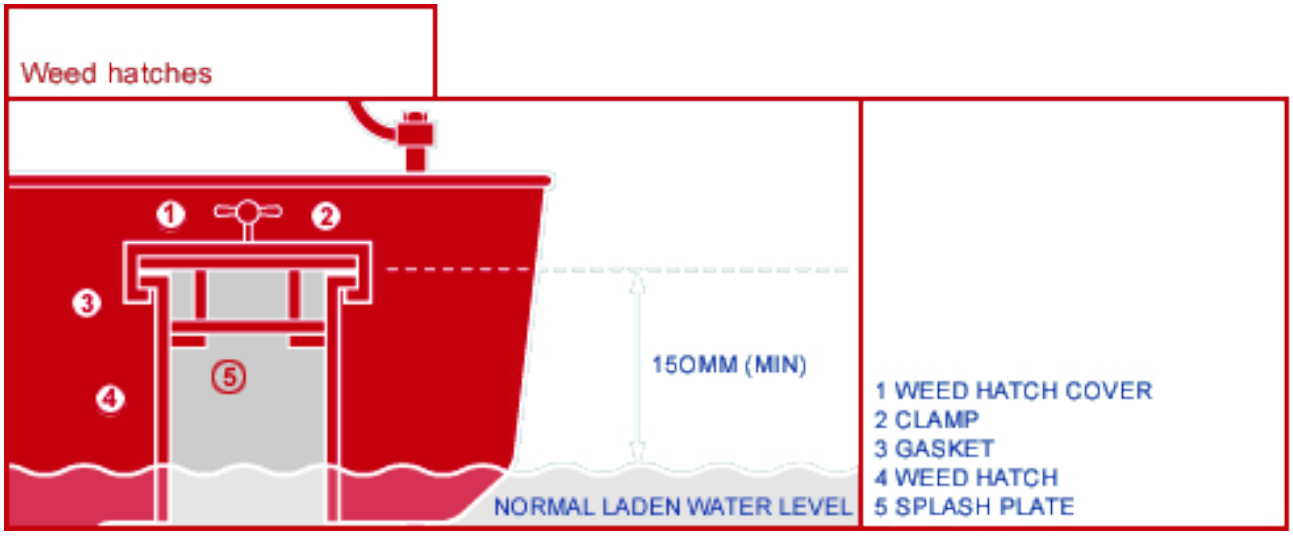
Hull Openings

The provisions of this section of Part 10 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

To reduce the risk of your boat sinking if it keels over or is excessively weighed down, it's a good idea for privately owned boats to only have openings which are at a height of at least 250mm (10ins) above the waterline. Where openings are necessary below this level this risk can be reduced by ensuring that these openings are permanently and securely connected to ducts or pipes, which are watertight up to that level.

Self-draining cockpits may not be able to meet the 250mm (10ins) recommendation but, for privately owned boats, it's a good idea to stop water getting into other parts of the hull by incorporating non-return valves in the drains and/or having bulkheads or cills up to a height of 150mm (6ins).

A weed hatch, if not properly secured, can allow water into the bilges of a boat, which could ultimately cause it to sink. It's advisable for privately owned boats to have a secure and watertight weed hatch which reaches to at least 150mm (6ins) above the waterline, when the boat is loaded up as normal. [10.3]



Part 10 - Non-Private Boats & Safety Features

Ventilation Labels

The provisions of this section of Part 10 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

To minimise the risk of carbon monoxide poisoning and to ensure that all appliances have enough air to operate efficiently it's recommended that instructions prohibiting the blocking of ventilators are prominently displayed on board privately owned boats. [10.5]

Part 10 - Non-Private Boats & Safety Features

Glass

The provisions of this section of Part 10 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

Falling onto an area of glass, such as a cabin window, could cause a serious injury. To minimise the risk of this happening it's recommended that all port lights, side-scuttles, windows and interior glass petitions are made of safety glass or of a suitable acrylic or polycarbonate material. Other forms of glass can be made safer by the use of suitable adhesive safety film for windows. [10.6]

Part 10 - Non-Private Boats & Safety Features

Unpowered Hotel Boats

The provisions of this section of Part 10 in the 2002 BSS Standards are mandatory for non-private boats where applicable.

On unpowered hotel boats which don't carry fuel and are not fitted with cooking, heating, refrigerating or lighting appliances, ineffective fire fighting equipment can put those on the boat at risk, as boat occupants won't be able to extinguish a fire or safely fight their way past a hazard. To prevent this from happening you must ensure that the minimum number of fire extinguishers is provided, in accordance with Standard 6.1. [10.7]

Part 10 - Non-Private Boats & Safety Features

Exemptions

All manually propelled or sailing hire boats which do not carry fuel and are not fitted with cooking, heating, refrigerating or lighting appliances, are exempt from these parts of these Standards.

Commercial cargo-carrying boats on cruising and remainder waterways are exempt from this part of the Standards. A remainder waterway is one that is owned or managed by British Waterways, which isn't specified in Schedule 12 of the Transport Act 1968.

Need More Help Or Advice On Part 10?

Refer to Standards 10.1-10.8 in the appendix. For more technical information refer to:

- SI 1999 No. 2721 The Merchant Shipping (Life-Saving Appliances for Ships
- other than Ships of Classes III to VI(A)) Regulations 1999.
- PrEN 15085 Man overboard prevention and recovery.
- PrEN 11812 Cockpits and cockpit drainage.
- BS EN ISO 9093-1 Seacocks and through hull fittings - Part 1: metallic.
- PrEN 9093-2 Seacocks - Part 2: Non metallic.
- PrEN 12217 Parts 1 - 3 Small Craft - Stability and Buoyancy.
- Canal Boatbuilders Association "Code of Practice for Steel Inland Waterways Craft and Narrowboat Construction"

Part 10 - Non-Private Boats & Safety Features

Part Ten Checklist

10.1		
	lifebuoys provided	☐
	lifebuoys carried in a readily accessible position	☐

10.2		
	hand/guard-rails fitted	☐
	hand/guard-rails of adequate strength	☐
	hand/guard-rails of adequate length	☐

10.3		
	lowest point of hull opening positioned greater than 250mm above normal laden waterline or is watertight up to 250mm	☐
	self-draining cockpit opening approved	☐
	weed hatch cover at least 150mm above normal laden waterline	☐
	weed hatch cover watertight when secured	☐

10.4		
	opening below waterline fitted with directly adjacent valve/cock hull opening valve readily accessible	☐

10.5		
	ventilation labels fitted	☐
	ventilation labels prominently displayed	☐

10.6		
	glass fitted to BS 952 Part 1*	☐
	acrylic/polycarbonate material suitable*	☐

10.7		
	unpowered hotel boat complies with Standard 6.1	☐

All checklist items relevant to the boat's installations are mandatory passes for non-private vessels

***EXEMPTION AVAILABLE**

BOAT SAFETY SCHEME®

Go boating - Stay safe

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