part two
inboard engines

Anchor Bend

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

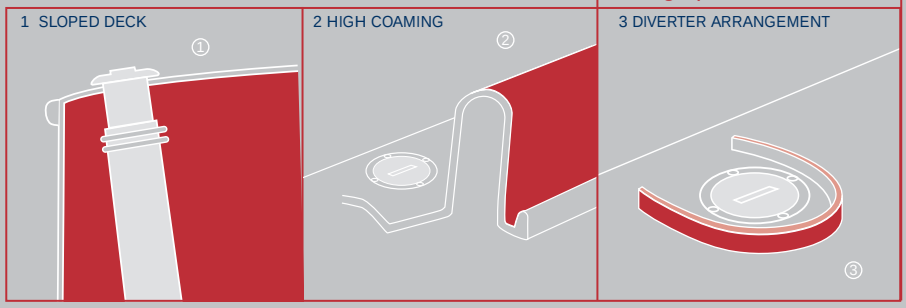
Keeping or using fuels such as diesel or petrol in confined and undrained spaces obviously carries a risk of providing fuel for a fire or explosion. The main aim of this Part is to keep fuel away from sources of ignition for as long as possible.

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, suitable for the fuel being used and kept away from sources of heat.

This Part applies to all boats with inboard engines and to other fixed fuel systems to appliances such as diesel heaters.

Part Eight of this Guide covers this type of appliance.

Filling options



fuel filling systems

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 1¼ 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 leak-proof 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.

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]

deck connections

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

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]

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]

vent pipes

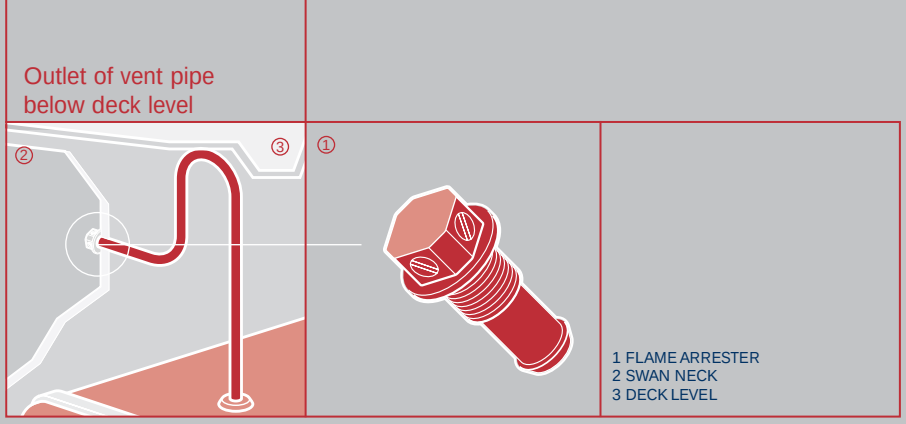
To help minimise the risk of fuel blowback it's important to allow air to be expelled from the fuel tank as it's being refilled. The fuel tank also needs to be able to 'breathe' to help the supply of fuel to the engine. Extreme temperature changes causes the volume of fuel to expand and contract. Fitting 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 ($^1/_2$ins) 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 J 1527 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

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 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]

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 turn to page A/1.

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.

Looking for the flame trap on your vessel? It could be fitted in the handrail above 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 tank will have been drilled before the rail is fixed. [2.5]

If there is a fire near the tank, you will need to ensure that the tank material does 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 $2^1/_2$ 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 $0.25 kgf/cm^2$ (or $3.5 lbf/in^2$) before being used, and must be marked to indicate this. All joints and seams on tanks must be properly welded, brazed or close-riveted to sustain that test.

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]

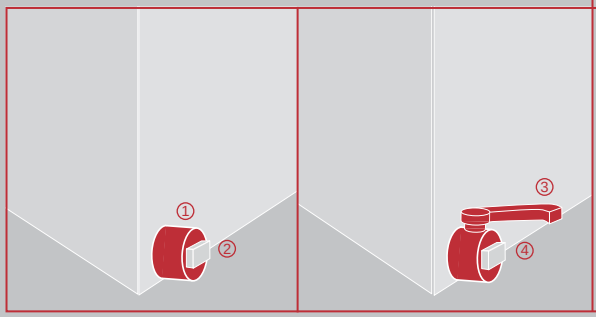
petrol & paraffin tanks

If petrol or paraffin tanks are placed near an engine or heating appliance there's a 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 gauges & dipsticks

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

Fuel tank drainage



1 FUEL TANK DRAIN
2 DRAIN PLUG
3 FUEL TANK DRAIN VALVE
4 DRAIN PLUG

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(s) 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]

bonding

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 earth point, 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 June 1998, which have a fuel tank drain without a valve, are exempt from this part of this Standard. [2.11]

fuel supply & fuel return pipes

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 2.17). 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

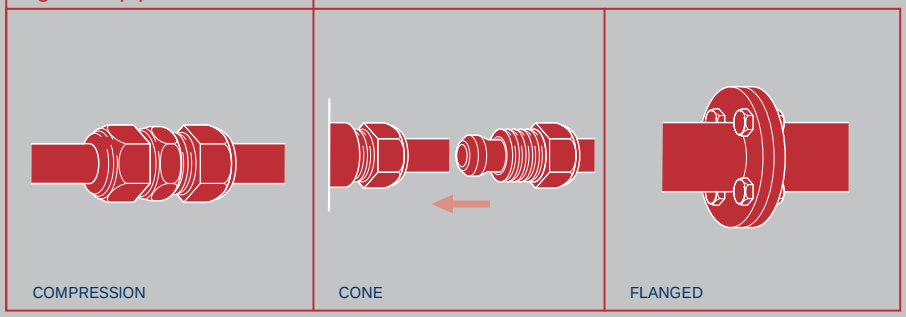
Balance pipes are only permitted in diesel fuelled installations. The risks of allowing them in petrol installations, where failure could lead to a bilge full of a volatile fuel, are simply too great. In the event of the balance pipes failing, there needs to be a way of shutting off the flow of fuel 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]

Fuel connections in rigid fuel pipework



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 $2^{1}/_{2}$ 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.

Spill racks (i.e. the pipes which are attached to, and carry return fuel from, the injectors on diesel engines) must be made from metallic pipe or fire resistant hose. Some automotive engines currently on the market, which have been adapted for marine use, are fitted with push-on, non-fire resistant hose. This arrangement is unacceptable. Conversion kits are available for most engines

and these are acceptable provided they are competently fitted. You should contact your marine engine supplier for further details.

Engines that are certificated 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]

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. 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

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.

fuel pipes in bilges

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

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]

exhaust noise

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]

Need more help or advice? Refer to Standards 2.1- 2.26 in the appendix page 7.
For more technical information refer to:

- BS EN ISO 10088 "Permanently installed fuel systems and fixed fuel tanks"
- BS EN ISO 15584 "Inboard petrol engines – Engine-mounted fuel and electrical components"
- BS EN ISO 16147 "Inboard diesel engines – Engine-mounted fuel and electrical components[1]"
- BS EN ISO 21487 "Permanently installed petrol and diesel tanks[2]"
- Steam Boat Association of Great Britain (www.steamboat.org.uk)
- LPGA Code of Practice 18 "Recommendations for the safe use of LPG as a propulsion fuel for boats, yachts and other craft". LPGA Tel: 01425 461612.

[1]Expected 2002 [2]Expected 2003

part two 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 material suitable 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	☐

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 100 mm 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*	☐

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 ☐

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

Check List items in bold are Mandatory

Check List items in italic are Advisory

*EXEMPTION AVAILABLE