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Outboard and portable combustion engines and portable fuel systems

The Boat Safety Scheme Essential Guide

For more technical information

The requirements in this chapter have been informed by, and may refer to, the following technical references, codes and regulations. If you are building, fitting-out or making substantial changes to a vessel, we strongly recommend you refer to, and take account of, the codes and regulations below:

- **LP Gas Association Code of Practice 18 'Recommendations for the safe use of LPG as a propulsion fuel for boats, yachts and other craft'**
- **SRO 1929 No. 952 'The Petroleum Spirit (Motor Vehicles etc.) Regulations 1929'**
- **Statutory Instrument 1982 No. 630 'The Petroleum Spirit (Plastic Containers) Regulations 1982'**

This chapter covers outboard motors, generators and other portable engines. Carrying portable fuel tanks and transferring fuel can be hazardous if care is not taken – for example, petrol vapourises very readily during refuelling and can ignite very easily. Other fuels bring their own risks and they should be handled with equal care. This chapter complements Chapter 2 (Fixed fuel systems and permanently installed engines) and reflects the particular hazards related to portable engines and their fuels on boats.

You can minimise the risks associated with escaping fuels by ensuring that fuel does not enter the interior of your boat, and that all components including portable fuel tanks and spare fuel containers, are suitable for the fuel used. Keeping these in good condition and securely stowing the fuel containers will also reduce the risk of fuel spillage.

An important preface on the nature of petrol

Petrol is very volatile, that is, it evaporates quickly generating highly flammable vapours. A small spill of petrol will create a large amount of vapour. Likewise, when it is being transferred and especially when a tank is being filled, the vapour in the 'empty' tank is displaced by the new liquid fuel. Even if the concentration of vapour is too rich to burn immediately, it will dilute to flammable or explosive levels, even though, given enough ventilation, it may dissipate to a safe level eventual.

Petrol vapour is three to four times heavier than air. It will sink to the lowest level of its surroundings, accumulating at low level in places such as unventilated bulkheads, lockers and bilges or in enclosed spaces such as the cabins and cockpits of boats.

There is good advice on safe refuelling, use and stowage of petrol in our leaflet 'Avoiding Fire Afloat – Safe Use of Petrol'.

All boats fitted with, or carrying, outboard or portable engines, whether they are in use or not, must comply with the following:

13 All portable and outboard engines and portable fuel systems must be designed, installed and maintained in a way that minimises the risks of explosion or of fire starting and spreading.

14 All spare petrol must be stored in a way that minimises the risk of fire and explosion.

15 All portable and outboard engines with integral petrol or LPG tanks, and all portable petrol tanks, must be stored in a way that minimises the risks of fire or explosion when not in use.

5.1 Portable fuel systems

Fixed fuel systems for outboard/power boats

The risks and requirements associated with fixed systems feeding liquid fuel or LPG to outboard or portable engines are set out in Chapters 2 and 7.

5.1.1/R REQUIREMENT

Do fixed fuel systems supplying outboard and portable combustion engines comply with the applicable BSS requirements for the fuel supply system?
Identify fixed fuel systems supplying outboard and portable combustion engines. Apply the relevant Part of the BSS requirements to the fixed fuel system.
Fixed fuel systems supplying outboard and portable combustion engines must be compliant with the applicable BSS requirements of Chapter 2 or Chapter 7.
Note – LPG-fuelled outboard engine fuel installations are assessed by special arrangement with the BSS Office. See Checklist Item 5.5.1.

Using components that are unsuitable for the fuel in use and/or not designed for the rigours of the marine environment can lead to leaks and failures. Garden water hose, or hose connections secured with a wire twist are glaring examples of unsuitability.

5.1.2/R REQUIREMENT

Are all components of portable fuel systems of suitable proprietary manufacture?

Check the type of all components of portable fuel systems including the tank, fuel hose and priming bulb, and hose connections.

Verify components not identified as of suitable proprietary manufacture, if necessary by examining any presented declaration from the manufacturer or supplier.

Portable fuel system components must be of suitable proprietary manufacture, for example:

- tanks must be designed to store petrol and permit convenient carrying and removal for refilling outside the vessel;
- hoses and other fuel components must be intended for use with petrol;
- hose connections must be secured with proprietary clamps, clips or ties.

Portable fuel system components not identified to be of suitable proprietary manufacture must be supported by an appropriate declaration from the manufacturer or supplier.

Note – Where components cannot be verified as being of suitable proprietary manufacture, they will be considered as not meeting the requirements until suitability can be verified.

Here we consider the potential for fuel to escape during use. Damage to the fuel supply system and deterioration may lead to small, unseen leaks or catastrophic failure during use.

5.1.3/R REQUIREMENT

Are all components of portable fuel systems complete and in good condition?

Check the completeness and condition of all portable fuel system components including the tank, fuel hose and priming bulb, and hose connections.

Check the completeness and condition of support structures and fixings on transom-mounted tank arrangements.

Portable fuel systems must be complete including the fuel tank cap, the hose, and hose clamps/clips.

Components of portable fuel systems must be free of leaks and signs of damage or deterioration.

Portable fuel tanks must be free of signs of significant pitting or repairs on metal tanks, or corrosive attack or repairs on plastic tanks.

The support structures and fixings on transom-mounted tank arrangements must be complete and free of signs of damage or deterioration.

Notes – All surfaces and seams on components, including tank undersides, should be examined.

Supplementary information on assessing deterioration of plastic fuel tanks is available on www.boatsafetyscheme.com or by post or email from the BSS Office.

Information

During a BSS examination or other inspection, particular attention will be paid to the underside of the portable fuel tank and so we recommend regular checks on the tank's condition.

An uncontrolled escape of fuel could lead to a significant build-up of flammable vapours and the risk of fire or explosion.

5.1.4/R REQUIREMENT

Are portable fuel systems fitted with a means of shutting off the fuel supply?

Check all portable fuel systems for the means of shutting off the fuel supply between the tank and the engine.

A means of shutting off the fuel supply between the tank and engine must be fitted to all portable fuel systems.

Note – Acceptable shut-offs include a valve, cock or proprietary self-closing connector.

Information
If a small amount of fuel escapes overboard, during refuelling it will be naturally diluted. If large quantities of fuel or other substances escape into a waterway you should contact the Environment Agency/Scottish Environment Protection Agency Pollution Hotline on 0800 80 70 60 (24hrs).

5.2 Portable petrol tanks

In the BSS 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.

There are limits on the size of petrol containers. Carrying too much petrol in one oversize tank can be difficult to handle safely without a risk of dropping or knocking the container. If you need a larger tank than this, it must be permanently installed and comply with the appropriate requirements in Chapter 2.

5.2.1/R REQUIREMENT

Does the maximum capacity of individual portable petrol tanks permit convenient carrying and removal for refilling outside the vessel?

Check the capacity of portable petrol tanks as marked on the tank.

The maximum capacity of portable petrol tanks must permit convenient carrying and removal for refilling outside the vessel.

The maximum capacity of portable petrol tanks must not exceed 27 litres (6 gal).

Notes – In the event the maximum capacity is not marked, assess the tank for obvious overcapacity. [1litre (approx ¼ gal) is equal to a cube 100mm x 100mm x 100mm (4in x 4in x 4in)].

Existing proprietary makes of portable petrol tanks of up to 30-litre (6½ gal) capacity are acceptable.

Stowed portable petrol tanks could present a risk of vapour flowing into the interior of the boat.

Self-adhesive reminder labels with the legend 'Refuel ashore – never on board' are available free of charge from the BSS Office. You are strongly recommended to fit them to all portable engine petrol tanks and spare petrol containers on board your vessel.

5.2.2/R REQUIREMENT

Are all portable petrol tanks stored, when not in use, to ensure that any leaking fuel or escaping vapour will not enter the interior of the vessel?

Check the storage location of portable petrol tanks not connected to the engine.

Portable petrol tanks, which are not connected to the engine, must be stored in the open where any leaked petrol would flow overboard unimpeded, or in suitable locker.

Any locker used to store spare petrol must be:

- drained to the outside from the bottom; **and**,
- secure and constructed of a material of the required thickness, in good condition; **and**,
- free from objects that could block the drain, damage the petrol container or cause petrol vapour to ignite; **and**,
- fuel-tight to an equal or greater height that the top of the cap for the petrol container; **and**,
- self-draining and the drain hole must have a minimum internal diameter of 12mm (½ in) and must not be blocked; **and**,
- the locker must not open into any engine, battery or electrical equipment space; **and**,
- the drain line material including connections must be complete and in good condition.

Note – these are identical storage arrangements for LPG cylinders the detail of which is to be found in Chapter 7, sections 7.1–7.5.

Best practice

We recommend that you mark clearly the type of fuel contained in any portable fuel tanks on your boat. The wrong fuel may stop your engine from working and in certain situations, e.g. tidal and other waterways with strong currents, the loss of engine power could put you in danger.

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5.3 Spare fuel containers

In the BSS context, a spare fuel container is one that can be carried on and off the boat and is designed to store spare fuel. A spare fuel container is not connected by piping to the engine.

Stowed spare fuel containers could present a risk of vapour flowing into the interior of the boat.

5.3.1/R REQUIREMENT

Are all spare petrol containers stored to ensure that any leaking fuel or escaping vapour will not enter the interior of the vessel?

Check the storage location of spare petrol containers.

Spare petrol containers must be stored in the open where any leaked petrol would flow overboard unimpeded, or in suitable locker.

Any locker used to store spare petrol must be:

- drained to the outside from the bottom; **and**,
- secure and constructed of a material of the required thickness, in good condition; **and**,
- free from objects that could block the drain, damage the petrol container or cause petrol vapour to ignite; **and**,
- fuel-tight to an equal or greater height that the top of the cap for the petrol container; **and**,
- self-draining and the drain hole must have a minimum internal diameter of 12mm (½ in) and must not be blocked; **and**,
- the locker must not open into any engine, battery or electrical equipment space; **and**,
- the drain line material including connections must be complete and in good condition.

Note – these are identical storage arrangements for LPG cylinders the detail of which is to be found in Chapter 7, sections 7.1–7.5.

The use of unsuitable containers to store petrol could lead to petrol leaking into the boat or the fuel not being correctly recognised by another person. UK law governs the carriage of spare petrol and limits the amount of spare petrol you may carry.

5.3.2/R REQUIREMENT

Are all spare petrol containers suitable for the purpose and limited to the permitted volume?

Check the type and capacity of spare petrol containers.

The amount of spare petrol carried is limited to any combination of the following containers:

- 2 x 10 litre (2 gal) metal containers marked to conform with the 1929 Petroleum Spirit Regulations;
- 2 x 5 litre (1 gal) plastic containers marked to conform with the 1982 Petroleum Spirit Regulations;
- 1 x portable petrol tank of suitable proprietary manufacture of up to a maximum capacity of 27 litres (6 gal).

Notes – The carriage of spare diesel or paraffin is not restricted by volume.

An existing proprietary make of portable petrol tank of up to 30-litre (6½ gal) capacity is acceptable.

Best practice

We strongly recommend that for storing fuels other than petrol, you use only the containers suitable for the fuel type as recommended by the manufacturer.

Information

The amount of petrol and the conditions under which it is stored at home and transported to your boat is covered by various regulations. These may differ in important respects from the BSS requirements. You can find out more information from your local fire and rescue service or your local authority.

A tank in poor condition could soon leak or fail completely, allowing vapour to build up to dangerous levels.

5.3.3/R REQUIREMENT

Are all spare fuel containers in good condition?

Check the condition of spare fuel containers.

Spare fuel containers must be free of signs of significant pitting or repairs on metal tanks, or corrosive attack or repairs on plastic tanks and must be free from leaks and other signs of damage or deterioration.

Notes – This check covers spare petrol, spare diesel and paraffin containers.

Close attention should be paid to the underside of spare fuel containers.

Supplementary information on assessing deterioration of plastic containers is available on www.boatsafetyscheme.com or by post or email from the BSS Office.

5.4 Outboard and portable combustion engines

Fuel system components on outboard and portable engines can present the same potential hazards as main fuel and spare fuel containers.

A fuel or gas escape into your boat from any part of your portable engine or generator would be a serious hazard.

5.4.1/R REQUIREMENT

Are all outboard and portable combustion engines free of fuel leaks?

Check for the presence of leaking fuel on or around all outboard and portable combustion engines.

Outboard and portable combustion engines must be free of obvious signs of fuel leaks.

Note – this check does not require the removal of outboard covers or generator hush covers.

5.4.2/R REQUIREMENT

Are all outboard and portable combustion engines with integral petrol or LPG tanks stored to ensure that leaking fuel or escaping vapour will not enter the interior of the vessel?

Check the storage location of outboard engines with integral petrol tanks and portable combustion engines with integral petrol or LPG tanks.

Outboard engines with integral petrol tanks and portable combustion engines with integral petrol or LPG tanks must be stored in the open where any leaked petrol would flow overboard unimpeded, or in suitable locker.

Any locker used to store spare petrol must be:

- drained to the outside from the bottom; **and**,
- secure and constructed of a material of the required thickness, in good condition; **and**,
- free from objects that could block the drain, damage the petrol container or cause petrol vapour to ignite; **and**,
- fuel-tight to an equal or greater height that the top of the cap for the petrol container; **and**,
- self-draining and the drain hole must have a minimum internal diameter of 12mm (½ in) and must not be blocked; **and**,
- the locker must not open into any engine, battery or electrical equipment space; **and**,
- the drain line material including connections must be complete and in good condition.

Notes – Outboard or portable combustion engines that are not stored, e.g. those that are running or connected, are not covered by this check.

These are identical storage arrangements for LPG cylinders the detail of which is to be found in Chapter 7 sections 7.1–7.5.

An insecurely mounted engine can lead to part of its fuel supply system becoming detached and fuel escaping with the potential to spread a fire or cause an explosion.

5.4.3/R REQUIREMENT

Are outboard engine mounting systems in good condition?

Check the condition of outboard engine mounting systems.

Assess the extent of any movement by applying light manual force to the outboard engine.

Outboard engines must be securely mounted so that there is no movement in any direction at the mounting points.

Mounting systems must be free of signs of damage or deterioration.

Note – Do not apply light manual force to engines that are too heavy to move.

Best practice

In addition to the normal mounting, we recommend you fit a security lanyard or wire from the engine to a secure eyebolt or bracket inboard of the engine.

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5.5 LPG-fuelled outboard propulsion engines

The incorrect installation of fuel supply arrangements to LPG-fuelled outboard engines may lead to LPG exploding and a fire. On dual fuel petrol/LPG installations there is a risk of damaging carburettor components, which could cause a petrol vapour explosion.

5.5.1/R REQUIREMENT

Do the fuel supply arrangements to LPG-fuelled outboard engines comply with LPGA CoP 18 and are any dual-fuel petrol/LPG arrangements of an acceptable type?

[LPG-fuelled outboard engines can only be checked for compliance by prior arrangement by the owner with the BSS Office.]

Check the fuel supply type to outboard engines and identify those fuelled by LPG or dual-fuel petrol/LPG.

The fuel supply arrangements to LPG-fuelled outboard engines must comply with LPGA Code of Practice (CoP) 18.

Any dual-fuel arrangements must be installed and maintained accordance with the engine manufacturer's guidelines for marine applications.

Notes – When planning a BSS examination, owners of LPG-fuelled outboard engines are advised to contact the BSS Office to arrange for an examiner who is competent to apply LPGA CoP 18, to undertake a full examination of the boat.

Examiners may determine compliance of portable LPG-fuelled generators to applicable BSS requirements.