

part eight

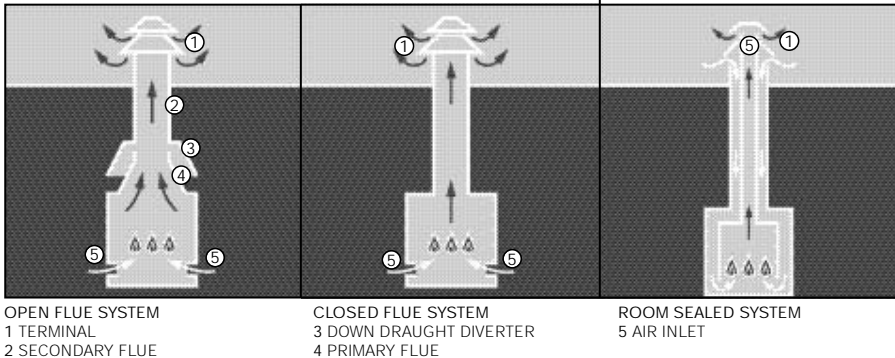
appliances, flueing & ventilation

Sheepshank

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.

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 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.

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:



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]

- ☞ 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.

fuel installation

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

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 room-sealed 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

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.

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

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]



flues & draught diverters

Appliances recommended as needing a flue are:

- 🔥 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 by-products, which may lead to carbon monoxide poisoning. To help prevent this from happening and to ensure the continued safe operation of your appliance it's recommended that flues and draught diverters fitted to it are 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]



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]

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]

installation

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.

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

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.

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 50°C 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)

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

To minimise the risk of scalding it's a very good idea to ensure that the water inlet to any instantaneous water heater is piped only from your boat's cold water system. [8.6]

fuel oil appliance

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

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 it's recommended that flue terminals and air inlets are not 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.

It's also recommended that flue terminals are 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]

ventilation

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 it's highly recommended that adequate fixed ventilation is provided on boats where LPG or other fuel appliances are used.

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

$$\text{minimum effective area (mm}^2\text{)} = [2200 \times U] + [650 \times P] + [440 \times F]$$

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.

It's recommended that ventilators are 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

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 is purely advisory and has no bearing upon your navigation licence application, unless it is issued in conjunction with the discovery of a gas leak in the system. If there is a leak 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.

Need more help or advice? Refer to Standards 8.1- 8.9 in the appendix page 14.

For more technical information refer to:

- 🔗 SIBS 5482-3:1999 "Code of practice for domestic butane and propane gas-burning installations – Part 3: Installations in boats, yachts and other vessels"
- 🔗 BS EN ISO 10239 "Small craft – liquefied petroleum gas (LPG) systems".
- 🔗 SI 1998 No. 2451 "The Gas Safety (Installations and Use) Regulations 1998 (www.hmso.gov.uk/stat).
- 🔗 Calor Gas: "LPG (Bottled Gas) for Marine Use"
- 🔗 BS EN ISO 14895 "Liquid fuelled galley stoves".
- 🔗 Calor Gas Limited, Customer Support Centre, Tel: 0845 766 1111.
- 🔗 Council for the Registration of Gas Installers (www.corgi-gas.com) Tel: 01256 372200

part eight checklist

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- 8.1 fuel installation in accordance with appropriate parts of these Standards
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- 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
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- 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*
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8.5 **flame supervision device fitted to appliance burners, ignition burners and pilot lights**

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 BS 5482-3*
fixed ventilation warning notice displayed as specified

Check List items in bold are Mandatory
Check List items in italic are Advisory

*EXEMPTION AVAILABLE

*INSTANTANEOUS WATER HEATERS ARE
ALLOWED BUT NOT RECOMMENDED



