part seven
lpg installations

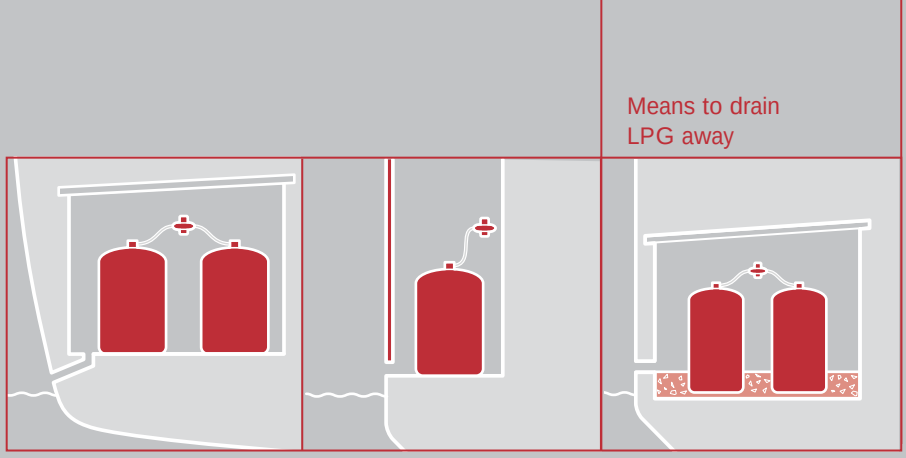
Reef Knot

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.

It's also strongly recommended that any work on LPG systems is carried out by a competent gas fitter.



CYLINDER LOCKER FOR CABIN CRUISER

CYLINDER LOCKER FOR NARROWBOAT

EXEMPTION SHOWING SOLID MATERIAL ARRANGEMENT

completion of LPG installation

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]

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]

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]

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]

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 ($^{3}/_{4}$ins). For boats manufactured before 3 January 2000, which carry no more than 15kg of gas, this diameter may be 12mm ($^{1}/_{2}$ins) – 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 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]

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]

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.

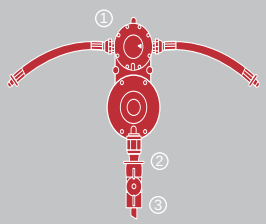
Boats manufactured before 3 January 2000 that were designed and constructed with a cylinder locker within the accommodation space are not required to comply with the above part of this Standard.

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]

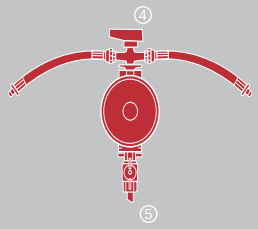
Alternative ways of connecting two LPG cylinders

AUTOMATIC CHANGEOVER DEVICE



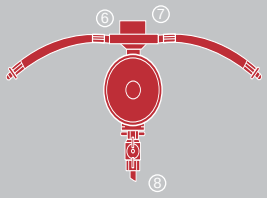
1 AUTOMATIC VALVE 2 GAS SUPPLY
3 MAIN SHUT OFF VALVE

MANUAL CHANGEOVER DEVICE



4 MANUALLY OPERATED VALVE
5 GAS SUPPLY

DOUBLE WALL BLOCK



6 PIGTAILS 7 NO VALVE
8 GAS SUPPLY

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]

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 office.

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 Type 2 of BS 3212 (or the equivalent European Standard for hose, BS EN 1763) 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]

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]

installation pipework

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]

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 Type 2 of BS 3212 or equivalent.

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-

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]

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]

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]

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.

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]

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]

installation of pipework

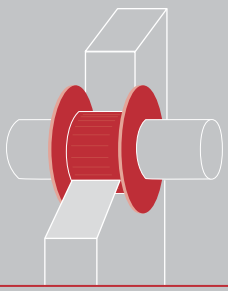
It's important that all parts of the gas system installation pipework on your boat are accessible for routine examination, service and replacement. Pipework that can't be examined may hide damage.

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.

Use of grommet through bulkhead



THE PIPE IS PASSING THROUGH A BULKHEAD AND THE GROMMET SUPPORTS IT AND PROTECTS AGAINST RUBBING DAMAGE.

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]

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 pipework

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]

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]

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]

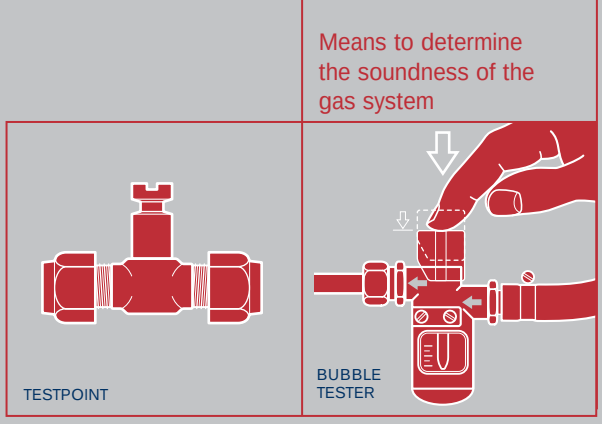
appliance isolation valve – numbering & design

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 spring-loaded 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]

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]

Need more help or advice? Refer to Standards 7.1 - 7.22 in the appendix page 11.
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”
  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 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 LPG	☐
	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 cylinder housing in self-draining cockpit – LPG-tight to interior of vessel to height specified	☐
	LPG cylinders housing in self-draining cockpit – hatches or openings watertight	☐
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 to type 2 of BS 3212	☐
	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	☐
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 to type 2 of BS 3212	☐
	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	☐
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 to electrical equipment	☐

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	☐
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	☐

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

*EXEMPTION AVAILABLE