Supporting Information Appendices for BSS Procedures, Processes & Checks

A	People Or Property In 'Immediate Danger' Or 'At Risk'
B	'Immediately Hazardous Boats'
C	LPG Installations Tightness Testing Using a Manometer ('U'-Gauge)
D	LPG Installations Tightness Testing Using a Post 2008 Alde 4071 Bubble Tester
D1	LPG Installations Tightness Testing Using a Pre-2008 Alde 4071 Leak Detector, or Other Makes of Bubble Tester
E	Flue Spillage Test – Open-Flued Appliances
F	230v AC Safe Disconnection Process
G	Disabled And Decommissioned Systems
2	Part 2 – Permanently Installed Fuel Systems and Fixed Engines
2a	2a – Requirements for Diesel Leak-Off Arrangements
2b	2b – Requirements for Steam Engine Pressure System Inspection Certificates
3	Part 3 – Electrical Systems
4	Part 4 – Electrical Propulsion Systems
5	Part 5 – Outboard & Portable Combustion Engines, Portable Fuel Systems & Spare Fuel
6	Part 6 – Fire Extinguishing, Escape and Carbon Monoxide Alarms
7	Part 7 – Liquefied Petroleum Gas (LPG) Systems
8	Part 8 – Appliances and Flues
8a	8a – Requirements for Fixed Ventilation
9	Part 9 – Pollution Prevention

A Appendix – People Or Property In 'Immediate Danger' Or 'At Risk'

The BSS Warning Notice

Complete a BSS Warning Notice in all cases where you suspect that people or property may be, or are, in 'immediate danger' or 'at risk' from faults in installations or appliances on a vessel being examined.

Several BSS Checks contain Applicabilities specifying where the actions described in Appendix A (or Appendix A and B) are to be taken.

The LPG tightness test Appendices require that if an LPG leak is identified you must take the actions described in Appendix A. The gas leak criteria for a 'Hazardous Boat Notification' (Appendix B) to be actioned are also set out in Appendix C and D or D1.

The purpose of the BSS Warning Notice is to alert: -

- the owner or person responsible for the craft's condition that an immediately hazardous defect has been found; **and**,
- anyone stepping aboard that they could be at risk and should take precautions.

Notes for completing a BSS Warning Notice

Hazardous Boat Notification:	Mark the box with a cross if applying Appendix B.
Defect class tick boxes:	All defects that are not LPG, ventilation or AC electrical system related, e.g. leaking fuel, please tick next to 'other (see description)' and write a brief description of the hazard in the space provided; for example, imminent risk of fuel-hose failure or significant quantities of fuel or other substances escaping into the watercourse.
Boat name:	Insert the boat name.
Brief description of boat:	Note the size. If you know the model and maker state these, if not, type and material e.g. 23ft FRP cruiser.
Index/registration/WIN:	Record at least one of these unique identifying marks whenever possible. (WIN is the Watercraft Identification Number, previously HIN or CIN, a 14-digit code issued to new build boats).
Description of the defect:	Insert the BSS Check Item number, but if not applicable write N/A. Always insert a brief description of the potential hazard. e.g. gas leak, flue gas spillage, heat damaged cables, electrical fire risks, poor ventilation, petrol leak, potential electric shock, etc.
LPG supply disconnected:	If Appendix B is applied because an immediate danger due to an LPG installation or appliance fault requires the disconnection of the LPG supply, put a Y or N in the box.
Owner aware of defect:	The owner (or representative) must be informed of the hazards concerned and advised to seek competent help to rectify the defect. Put a Y or N in the box. If the owner is not informed, add the reason why. If the owner has been informed, but does not commit to fix the defect, contact the BSS Office.
Date/time notice issued:	Insert the date and precise time (24-hour clock) of the issue of the BSS Warning Notice.
Signed:	Sign in the box and add your BSS PIN.

Hand the two top copies of the BSS Warning Notice to the owner, or send one copy (printed version or electronic means) if not present. Advise the owner to leave one copy displayed in a prominent position on board the boat (or leave one copy yourself if owner not present). The position should be where anyone entering onto the boat will be sure to see it. Retain a copy with the boat's Examination records.

B Appendix – 'Immediately Hazardous Boats'

Hazardous Boat Notifications - definition

Hazardous Boat Notifications apply where you suspect that people or property may be, or are, in 'immediate danger' and consist of a combination of notifications applied as appropriate as described below, to the owner, relevant third parties and/or the BSS Office.

Hazardous Boat Notification Actions

A BSS Warning Notice must be completed in accordance with Appendix A in all cases where you apply Appendix B.

Where the hazard(s) placing people or property in 'immediate danger' relate to:

- leaking gas, where the extent of the LPG leak meets the criteria for a Hazardous Boat Notification to be actioned, as set out in Appendix C and D or D1;
- leaking petrol;
- gas refrigerators with naked flames on petrol-powered boats;
- severely heat damaged cables or other significant or immediate electrical fire risks;
- AC electrocution risks;
- escaping appliance flue gases into the interior of the vessel in circumstances where the hazard cannot be controlled by disconnecting the fuel supply to the system or appliance;
- significant quantities of fuel or other substances escaping into the watercourse.

…take the following Hazardous Boat Notification actions in addition to those actions in Appendix A:

- inform the owner (or representative) about the hazards as soon as possible;
- ask for the hazard to made safe or controlled immediately, such as by turning off the fuel or disconnecting the electricity supply;
- recommend that the systems, installations or appliances are not used again until fixed;
- recommend that any repairs are carried out by a competent person.

It is recommended that a brief note is made and kept with your personal record concerning any action taken by the owner (or representative) to control the hazard or any proposed actions.

Further necessary notifications

Further notifications will be necessary in circumstances:

- Where the owner (or representative) refuses to co-operate in making safe or controlling the hazard, then urgently notify the BSS Office.
- Where the boat is located at any mooring, marina, or basin operated by a third party, notify a person representing the organisation responsible for those moorings of the situation, and the action taken.
- Where the hazard cannot be made safe or controlled **and** the person representing the organisation responsible for the boat mooring could not be contacted, then urgently notify the BSS Office.
- Where the hazard cannot be made safe or controlled **and** neither the person representing the organisation responsible for moorings or the BSS Office could be contacted, then urgently notify the relevant navigation authority or harbour authority, if necessary, by using emergency contact telephone numbers.
- Where an emergency situation exists and contact with the emergency services, as necessary.

Hazards requiring the gas supply to the installation or appliance to be turned off

Take the additional actions detailed below if the hazards relate to:

- leaking gas, where the extent of the LPG leak meets the criteria for a 'hazardous boat' notification to be actioned as set out in Appendix C and D or D1; **or,**
- leaking flue gases from LPG appliances, in any unusual circumstance where the hazard cannot be controlled by disconnecting the LPG supply to the system or appliance

Additional actions:

- Explain to the owner the immediate danger and why the gas supply to the installation or appliance should be immediately turned off.
- Inform the owner that the installation or appliance should not be used until a competent person rectifies the fault(s).
- Request the owner to turn off or disconnect the gas supply at cylinder(s), main shut-off valve(s), or the appliance as appropriate and, if appropriate, replace any protective caps or plugs to the disconnected cylinder connections.
- Secure an LPG Warning Label in a prominent position on or near the main shut off valve or appliance as appropriate.

Important note. You must take special care if the action taken results in the disconnection of the heating systems on boats with people living on board in cold weather.

In extreme cases e.g., where there are elderly, young or disabled people on board, it may be necessary to recommend to the owner to notify Social Services, or other authorities, or friends or family so that alternative sources of heat can be provided.

Making and Reporting Hazardous Boat Notifications

In circumstances where the hazard(s) placing people or property in 'immediate danger' cannot be made safe or controlled, urgent notifications should be made face-to-face if relevant, or by phone.

Other notifications can be made by other means including email.

All Hazardous Boat Notifications must be reported to the BSS Office. This is achieved when you complete the 'HB Note' section of the boat record on the BSS Examination database. At the time the information is entered an automated email is then sent to BSS Office team members.

C Appendix – LPG Installations Tightness Testing Using A Manometer (U-Gauge)

Smell Of Gas On Board

If upon entering a boat or at any time during a BSS examination an Examiner smells gas, and where they have cause to suspect that people or property may be or are in 'immediate danger' or 'at risk' due to leaking gas, they must take the actions described in ECP Appendix A (BSS Warning Notice) and Appendix B (BSS Hazardous Boat)

If gas is smelt during a tightness test and where the Examiner has cause to suspect that people or property may be or are in 'immediate danger' or 'at risk' due to leaking gas they should also terminate the tightness test and record a non-compliance at Check 7.12.2.

Boats Within Scope Of The Gas Safety (Installation & Use) Regulations (GSIUR)

Hire boats, passenger boats, residential boats, houseboats and floating businesses fall within the scope of the Gas Safety (Installation and Use) Regulations (GSIUR). For any 'work' undertaken on these classes of vessel it is obligatory that the person undertaking the 'work' is licenced for that activity with Gas Safe Register. The definition of 'work' within the Regulations includes the removal and replacing of a screwed test nipple on a gas-tightness test point.

Non-Gas Safe registered BSS Examiners can only complete Check 7.12.2 on boats within the scope of the Regulations by either:

- undertaking a tightness test using a bubble leak tester as prescribed at Appendix D; or
- observing and recording the pressure gauge tightness test conducted by a Gas Safe Register Licenced gas operative (LPG-boats competency showing on licence card).

Additional information is available on the BSS website - search 'Boats in scope of GSIUR'

Suitable Pressure Gauges

This procedure may only be undertaken using a suitable proprietary fluid 'U' gauge or electronic gauge. Fluid 'U' gauges shall be capable of being read to 0.5 mbar, and electronic gauges shall be capable of being read to 0.1 mbar.

Definition Of 'No Discernible' Movement

A movement of 0.25 mbar or less on a fluid 'U' gauge is considered to be 'not discernible'. Therefore, if the gauge is seen to move, it can be inferred that the pressure within the installation has altered by more than 0.25 mbar.

It follows that, where a gauge that can register discernible movement of less than 0.25 mbar, i.e. an electronic gauge is used, the pass criteria of 'no discernible' movement has to be considered to be a maximum of 0.25 mbar except for those gauges that read to one decimal place when 'no discernible' movement is considered a maximum of 0.2 mbar.

Maximum LPG Installation Pipework Volumes

This procedure can only be used for installations with a pipework volume less than 0.002m^3 for propane and 0.0015m^3 for butane. On most small craft the pipework volumes will be less than these maximum volume parameters, but on vessels where there is an exceptionally large quantity of pipework, and/or pipework with particularly large diameters (e.g. 15mm and above), Examiners should be cautious and calculate the pipework volume. If the pipework volume exceeds 0.002 m^3 for propane or 0.0015 m^3 for butane contact the BSS Office for advice.

Table C.1 provides the volume for a 1 m length of the pipework diameters indicated. Examiners may determine the installation volume by estimating the length of each diameter of pipe installed on the boat in metres, and multiplying it by the appropriate volume given in the table. The total volume in m^3 is then determined by adding the volumes of each diameter of pipe together.

Examiners are also required to calculate the pipework volume for all boats where the LPG installation is found not to be gas-tight. As set out at step C.6 (and in Table C.3), in the event of a gas leak Examiners must know the pipework volume when determining whether or not to follow the Hazardous Boat procedures.

Table C.1 Example Pipe Volumes

Copper Tube Size (inches/mm)		Volume for 1m length (m^3)
1/4"	6mm	0.00002
5/16"	8mm	0.00004
3/8"	–	0.00005
–	10mm	0.00006
1/2"	–	0.00010
–	15mm	0.00014
–	22mm	0.00032

The BSS Requirements and BSS Examination Checking Procedures Appendices A and B

For a 'pass' at Check 7.12.2. there must be no discernible pressure drop during the tightness test (step C.3.) and no let-by (step C.4.).

If there is a discernible pressure drop at step C.3 or let-by is present Examiners must follow the procedures in Appendix A (issue a BSS Warning Notice).

The procedures at Appendix B (BSS Hazardous Boat) are only applied in circumstances where the pressure drop during the tightness test at C.3. exceed the relevant figures in Table C.3.

Therefore, in summary, a BSS Warning Notice must be issued for any discernible pressure drop (or if let-by is present), but the BSS Hazardous Boat procedures are only activated in cases where the pressure drop exceeds the relevant figures in Table C.3.

Guidance on the Test Procedures

The following procedures assume the installation is connected to one or more LPG cylinders. Do not proceed with the test if the boat's gas supply is shore-based (contact the BSS Office for advice).

Only proceed with the test once the Checks at 7.1.1 to 7.12.1 have been applied. Do not proceed with the test if:

- faults have been identified which could compromise the gas tightness of the installation, or
- a non-compliance has been identified at Check 7.8.3, or
- there is a smell of gas on board and the Examiner has cause to suspect that people or property may be or are in 'immediate danger' or 'at risk' due to leaking gas.

For installations where there is an in-line shut-off valve immediately downstream of the regulator this should be taken as the 'supply control valve'. For installations where there is no in-line shut-off valve immediately downstream of the regulator the cylinder valve(s) should be taken as the 'supply control valve'.

C.1 Preparations

1. Ensure all burner control taps, including any for pilot burner supplies, are turned off.
2. Ensure any appliance isolation valves and any additional in-line shut-off valves are open (on a cooker with a fold down lid, lift the lid to the fully open position to ensure activation of any safety shut-off valves).
3. Pressurise the installation by opening a cylinder valve.

4. Check all high-pressure stage components for gas leaks using proprietary leak detection fluid complying with BS EN 14291. Where the supply control valve is an in-line valve immediately downstream of the regulator, also check all joints between the regulator and the valve with the leak detection fluid. On completion, wipe off any remaining residues of leak detection fluid.

   Note 1 If a leak is identified record a fail at Check 7.12.2 and follow the procedures at Appendix A. If the leak is from a high-pressure stage component also follow the Hazardous Boat procedures at Appendix B. Do not proceed with the test.

C.2 Procedure: Connecting the Pressure Gauge and Purging the Installation

1. Close the supply control valve.
2. Ignite one appliance burner and burn off all the gas. Turn off the burner control tap.
3. Zero the pressure gauge.
4. Connect the pressure gauge to a proprietary test point downstream of the supply control valve.
5. Slowly open the supply control valve to fill the installation with gas.
6. Purge the installation of air by igniting a small burner on each appliance until a steady flame is established. Turn off all burner control taps.
7. Close the supply control valve.

C.3 Procedure: Tightness Test

1. Ignite a small burner on one appliance and allow pressure to fall to the tightness test pressure (TTP) of 30 mbar (propane) or 20 mbar (butane). Turn off the burner control tap.
2. Wait at least 5 minutes for temperature stabilisation. Do not proceed with the tightness test until the pressure is stable for at least two minutes.

   Note 2 For installations with a high-pressure hose(s) between the cylinder valve and regulator, where the cylinder valve is the only form of supply control valve, a rise in pressure may be due to retained pressure within the hose (hysteresis). In this situation it may be necessary to wait up to 30 minutes for stabilisation. In such circumstances the pressure should, periodically, be reduced back to the TTP until stabilisation is achieved.

   Note 3 For installations where there are no high-pressure hose(s), or there are high-pressure hose(s) but the supply control valve is an in-line valve immediately downstream of the regulator, an ongoing rise in pressure beyond the initial 5 minute period may indicate the supply control valve is letting by. In such situations, immediately undertake a let-by test as described at step **C.4**.

   Note 4 An ongoing decrease in pressure will probably be due to a gas leak on the installation. In such situations undertake the actions at Note 6.

3. Record the stable pressure gauge reading, wait for two minutes (the test period), and then note the pressure gauge reading again.
4. To pass the tightness test there must be no discernible pressure drop during the 2-minute test period at step C.3.3.

   Note 5 If there was no discernible pressure drop during the 2-minute test period proceed with the let-by test at C.4.

   Note 6 If there was a discernible pressure drop during the 2-minute test period:

   a. undertake the post-test procedure starting at C.5.3; **and,**
   b. record a fail at 7.12.2; **and,**
   c. follow the procedures at Appendix A; **and,**
   d. apply step C.6.

C.4 Procedure: Let-By Test

1. With the installation unchanged from the tightness test, ignite a small burner on one appliance and allow the pressure to fall to between 7 and 10 mbar.
2. Record the pressure gauge reading, wait for 2 minutes (the test period), and then record the pressure gauge reading again.
3. To pass the let-by test there must be no discernible pressure increase during the 2-minute test period at step C.4.2.

Note 7 If the installation passed the tightness test and let-by test record a 'pass' at 7.12.2. and undertake the post-test procedure at C.5.

Note 8 Where a supply control valve is found to be letting-by repeat the entire test having operated the valve several times to endeavour to clear the fault. If, after repeating the entire test, the let-by remains, the supply control valve(s) shall be deemed to have failed the let-by test.

Note 9 If the supply control valve(s) have failed the let-by test:

a. undertake the post-test procedure starting at C.5.3; **and**
b. record a fail at 7.12.2; **and**
c. follow the procedures at Appendix A.

C.5 Procedure: Post-Test

1. Raise the pressure in the installation by opening the supply control valve. Ignite a burner on one appliance to confirm the supply has been established and then shut off the burner. Check the gauge to confirm that the regulator has locked-up and record the stable lock-up pressure. If the lock-up pressure exceeds the figures given in Table C.2, or a stable lock-up pressure is not obtained within 60 seconds of the appliance burner being turned off, apply the Examiner action and the Guidance for owners at Check 7.12.2.
2. Turn off the supply control valve.
3. Ignite a burner on one appliance and burn off all the gas. Turn off the burner control tap.
4. Disconnect the pressure gauge.
5. Replace the test point nipple and coat with proprietary leak detection fluid complying with BS EN 14291.
6. Open the supply control valve.
7. Check the test point nipple for signs of bubbling leak detection fluid. Wipe the leak detection fluid residues off the test point.
8. Ensure all cylinder valves are turned off.
9. Return any in-line shut-off valves and any appliance isolation valves to the position they were in prior to starting the test procedure.

Note 10 - regulators intended for the caravan market operate at 30 mbar using butane or propane, or a mix

Table C.2 Industry Recommended Regulator Lock-Up Criteria

Gas Type	Nominal Operating Pressure	Maximum stable Lock Up Pressure	Maximum time to stable lock-up Pressure
Butane	28 mbar	40 mbar	60 sec
Propane	37 mbar	50 mbar	60 sec
LPG[1]	30 mbar	40 mbar	60 sec

C.6 Hazardous Boat Activation

1. If the pressure drop recorded during the tightness test procedure at step C.3.3 exceeds the relevant figure in Table C.3 the Hazardous Boat procedures at Appendix B must be followed. If the recorded pressure drop does not exceed the relevant figure in Table C.3 no further action is required other than to follow the procedures at Appendix A.

   Note 11 – utilise the criteria for Propane, for 30 mbar caravan regulators using butane or propane, or a mix

Table C.3 Hazardous Boat Activation Criteria

Gas Type	Installation Volume (m^3)	Pressure Drop (in 2 Minutes) Criteria for Hazardous Boat activation (mbar)
Butane (Tightness test pressure 20 mbar)	≤ 0.001	> 3.0
	> 0.001 ≤ 0.0015	> 2.0
Propane (Tightness test pressure 30 mbar)	≤ 0.001	> 4.0
	> 0.001 ≤ 0.002	> 2.0

D Appendix – LPG installations tightness testing using a post 2008 Alde 4071 bubble leak detector

Smell of Gas on Board

If upon entering a boat or at any time during a BSS Examination an Examiner smells gas, and where they have cause to suspect that people or property may be or are in 'immediate danger' or 'at risk' due to leaking gas, they must take the actions described in ECP Appendix A (BSS Warning Notice) and Appendix B (BSS Hazardous Boat)

If gas is smelt during a tightness test and where the Examiner has cause to suspect that people or property may be or are in 'immediate danger' or 'at risk' due to leaking gas they should also terminate the tightness test and record a non-compliance at Check 7.12.2.

Guidance on the Alde 4071 Leak Detector Test Procedure

The following procedure assumes that the installation is connected to one or more LPG cylinders. Do not proceed with the test if the boat's gas supply is shore-based (contact the BSS Office for advice).

Only proceed with the test once the Checks at 7.1.1 to 7.12.1 have been applied. Do not proceed with the test if:

- faults have been identified which could compromise the gas tightness of the installation, or
- a non-compliance has been identified at Check 7.8.3, or
- there is a smell of gas on board and the Examiner has cause to suspect that people or property may be or are in 'immediate danger' or 'at risk' due to leaking gas.

Only use a bubble leak tester to determine the tightness of an LPG installation if it is:

a) a permanently installed ALDE Leak Detector model 4071;

b) installed in a cylinder locker or housing;

c) in a readily accessible location which enables:

   - the test button to be clamped down for an uninterrupted 2 minute period; and,
   - a clear view of the fluid chamber to be safely maintained for an uninterrupted 2 minute period;

d) installed level, and securely mounted using the manufacturer's proprietary fixing points;

e) installed so that the direction of flow of gas is correct;

f) installed immediately after the regulator.

The test procedures assume the ALDE's test button can be held down using a clamp, but where this is not practicable Examiners may depress and hold down the test button by hand at steps D.2.2. and D.3.1.

Also, do not proceed with the test if:

g) the fluid in the chamber appears opaque or coloured (which indicates it is contaminated);

h) the top of the fluid in the chamber is visibly above or below the area between the two-level indicator lines around the circumference of the chamber;

i) on a butane system the ambient temperature is below 10°C.

This procedure is for post 2008 ALDE 4071 models only. This is because the manufacturer's production quality since that date provides full confidence concerning the results from applying the test procedure. In the event the bubble tester is not recognised as a post-2008 ALDE 4071 Leak Detector, utilise Appendix D1.

Figure 1. A post-2008 ALDE Leak Detector.

The current model 4071 is available with a blue or a silver finish to the main body.

Figure 2. '4071' should be clearly visible on a label on the red test button.

Figure 3. A pre-2008 ALDE model. Appendix D1 applies.

If an ALDE 4071 Leak Detector is fitted, but is found to be obviously damaged, or does not meet all the installation requirements at items b) to i), above, the Detector cannot be used to undertake a tightness test.

The BSS Requirements and Appendices A and B

For a 'pass' at Check 7.12.2. there must be 3 or less bubbles over the 2-minute test period for butane, or 4 or less bubbles for propane (see Table D.1.)

If 4 or more bubbles are seen on a butane system, or 5 or more on a propane system, a 'fail' must be recorded at 7.12.2 and Examiners must follow the procedures in Appendix A.

The procedures at Appendix B (BSS Hazardous Boat notification) are only applied in circumstances where the leak rate is such that 27 or more bubbles are seen over the 2-minute test period on a butane system, or 32 or more bubbles are seen on a propane system (see Table D.2.).

D.1 Preparations

1. Ensure all burner control taps, including any for pilot burner supplies, are turned off.
2. Ensure all appliance isolation valves and any additional in-line shutoff valves are open (on a cooker with a fold down lid, lift the lid to the fully open position to ensure activation of any safety shutoff valves).
3. Pressurise the installation by opening a cylinder valve.
4. Check all joints between the cylinder(s) connection and the ALDE Leak Detector, including any joints on the detector's by-pass arrangement (if fitted), for gas leaks using proprietary leak detection fluid complying with BS EN 14291. On completion, wipe off any remaining residues of leak detection fluid.

   Note 1 If a leak is identified record a fail at Check 7.12.2 and follow the procedures at Appendix A. If the leak is from a high-pressure stage component also follow the Hazardous Boat procedures at Appendix B. Do not proceed with the test.
5. If a by-pass arrangement is fitted, ensure the valves are set to allow flow through the ALDE Leak Detector.
6. Purge the installation of air by igniting a small burner on each appliance until a steady flame is established. Turn off all burner control taps.

D.2 Procedure: Fluid Check

1. Ignite a small burner (e.g. on gas hob / pilot burner).
2. Depress fully the test button, fit the proprietary clamp, and check for bubbles appearing in the fluid chamber.

Note 2 When the test button is depressed bubbles should appear in the fluid chamber thereby confirming that fluid is present and the detector is operating. Allow the bubbles to flow for at least 10 seconds. If no bubbles appear there may be insufficient fluid in the chamber or the detector may not be operating correctly. If no bubbles appear do not proceed with the test and record a fail at 7.12.1.

Note 3 When bubbles are seen during this fluid check procedure, but they are erratic in their flow rate or size, it is likely that the detector is faulty and it should therefore be taken that it is not operating correctly. Under such circumstances do not proceed with the test and record a fail at 7.12.1.

3. Turn off the small burner.

D.3 Procedure: Tightness (Steady State Bubble) Test

1. With the ALDE's test button depressed continuously, carefully count any steady-state bubbles appearing in the fluid chamber over the following 2 minutes (the test period). Where seen, record the number of bubbles.

2. To pass the tightness test the number of steady bubbles counted over the 2 minute test period must be less than, or equal to, the maximum number of steady state bubbles given in Table D.1.

Table D.1: Maximum Steady State Bubble Rate for a 'Pass'

Maximum Number of Steady State Bubbles (bubbles in 2 minutes)	
Butane	3
Propane	4

Note 4 If the number of steady state bubbles counted over the 2-minute test period exceed the maximum number given in Table D.1:

a. undertake the post-test procedure at D.4; and
b. record a fail at 7.12.2; and
c. follow the procedures at Appendix A; and,
d. apply step D.5.

D.4 Procedure: Post- Test

1. Ensure all cylinder valves are turned off.

2. Remove the proprietary clamp from the Detector.

3. If fitted, re-instate the flow through the Detector's by-pass arrangement.

4. Return in-line shut-off valve(s) and any appliance isolation valves to the position they were in prior to starting the test procedure.

D.5 Hazardous Boat Activation

1. If the number of steady state bubbles counted over the 2-minute test period is greater than, or equal to, the number given in Table D.2 then the Hazardous Boat procedures at Appendix B must be followed.

Table D.2: Minimum Steady State Bubble Rate for Hazardous Boat Activation

Minimum Number of Steady State Bubbles for Hazardous Boat Activation (Bubbles In 2 mins)	
Butane	27
Propane	32

D1 Appendix – LPG Installations Tightness Testing Using A Pre-2008 Alde 4071 Leak Detector, Or Other Make Of Bubble Tester

This procedure applies to:

- pre-2008 ALDE 4071 Leak Detectors; **or**,
- any other make/model of bubble tester, i.e. Gaslox

For post-2008 ALDE 4071 Leak Detectors, Appendix D applies

Figure 1. A Gaslox bubble tester. This Appendix D1 applies

Figure 2. A pre-2008 ALDE model. This Appendix D1 applies

Figure 3. Post 2008 ALDE Leak Detector. Appendix D applies

Examiners should apply the following preparatory sections from Appendix D:

- **Smell Of Gas On Board**
- **Guidance On The Alde 4071 Leak Detector Test Procedure**
- **D.1 - Preparations**
- **D.2 - Procedure: Fluid Check**

D.3 LPG-Tightness Test Procedure

1. With the bubble tester's test button depressed continuously, carefully count any bubbles appearing in the fluid chamber over the following 60 seconds (the test period).
2. To pass the tightness test the number of bubbles counted over the 60 second test period must be zero.

Note 1: If bubbles are counted over the 60 second test period:

a. undertake the post-test procedure at D.4; and
b. record a fail at 7.12.2; and
c. follow the procedures at Appendix A and Appendix B

D.4 Procedure: Post- Test

1. Ensure all cylinder valves are turned off.
2. Remove any proprietary clamp from the bubble tester.
3. If fitted, re-instate the flow through the bubble testers by-pass arrangement.
4. Return in-line shut-off valve(s) and any appliance isolation valves to the position they were in prior to starting the test procedure.

E Appendix – Flue Spillage Test – Open-Flued Appliances

Important Note

Flue spillage tests are to be undertaken on LPG appliances fitted with open flues which incorporate draught diverters. Spillage testing is not undertaken on LPG appliances with open flues not fitted with a draught diverter (sometimes referred to as closed flues), or on solid fuel or liquid fuelled appliances).

The procedures set out below are to be carried out where there are no manufacturer's recommendations available for testing the flue.

E.1 Preparations

Visual inspection of appliance

Close all doors, windows, adjustable ventilators

Turn off any extractor fans in the same or adjoining compartments

Light the appliance and allow a 5 minute warm up period before starting the test

Fix a smoke match into a smoke match holder

Note: If the flue passes this check it will be retested with these fans operating. See below at E.3.

E.2 Test Procedure

Light the smoke match

The match is lit and held 5-10mm inside the lower lip of the draught diverter or inside the edge of the canopy or smoke hood

The match is moved to encompass as much of the draught diverter or canopy/smoke hood as possible

All smoke should be drawn into the flue and removed to the outside air. Any temporary or momentary back-spillage may be discounted

If continuous smoke spillage occurs allow a further warm-up period of 10 min and recheck as described above

E.3 Re-Test With Any Extractor Fans In The Same Or Adjoining Compartments Operating

Switch on any fan(s). If there is a fan in an adjoining compartment it should be operated with the connecting doors open

Carry Out Retest As Described Above

All smoke should be drawn into the flue and removed to the outside air

Any Temporary Or Momentary Back-Spillage May Be Discounted

E.4 Post-Test Procedure

Turn off the appliance and return the system to its pre-test condition

Appendix F sets out the recommended 230V AC Safe Disconnection Process to be followed by BSS Examiners to confirm the boat is electrically dead before starting the BSS Examination.

The BSS have concluded that the only way to be certain that Examiners are not at risk from electrocution from 230V systems while they are performing a BSS Examination, especially those who are not competent electricians, is to make the boat 'electrically dead'.

The 230V AC Safe Disconnection Process has been designed to support BSS Examiners to mitigate these risks.

BSS Examiners who are competent electricians and who provide electrical services as part of their business outside of the BSS can choose to adopt their own normal risk assessment practices and use their associated equipment, provided that any non-BSS advice or guidance issued, is the subject of a separate contract outside of the BSS Examination.

Managing your safety **Points to note**

The following icons have been used to emphasise points which need extra attention:

Appendix F starts with a flowchart, which is broken into colour bands.
After the flowchart is a step-by-step description of the process which needs to be followed.
The steps described are broken into the same colour bands as the flowchart.

F1. Before attending the boat

There is only one Step for 'before attending the boat' and this should be done during the initial conversations with the owner to book the Examination.

The BSS 230V AC Safe Disconnection Process assumes that the boat owner or their representative will be on board to undertake certain key procedural Steps. Therefore, whenever possible Examiners should work with their customers to make sure that the owner or their representative are present. However, in cases where this is not possible, Examiners may undertake the owner's tasks providing a suitable agreement has been reached with the owner.

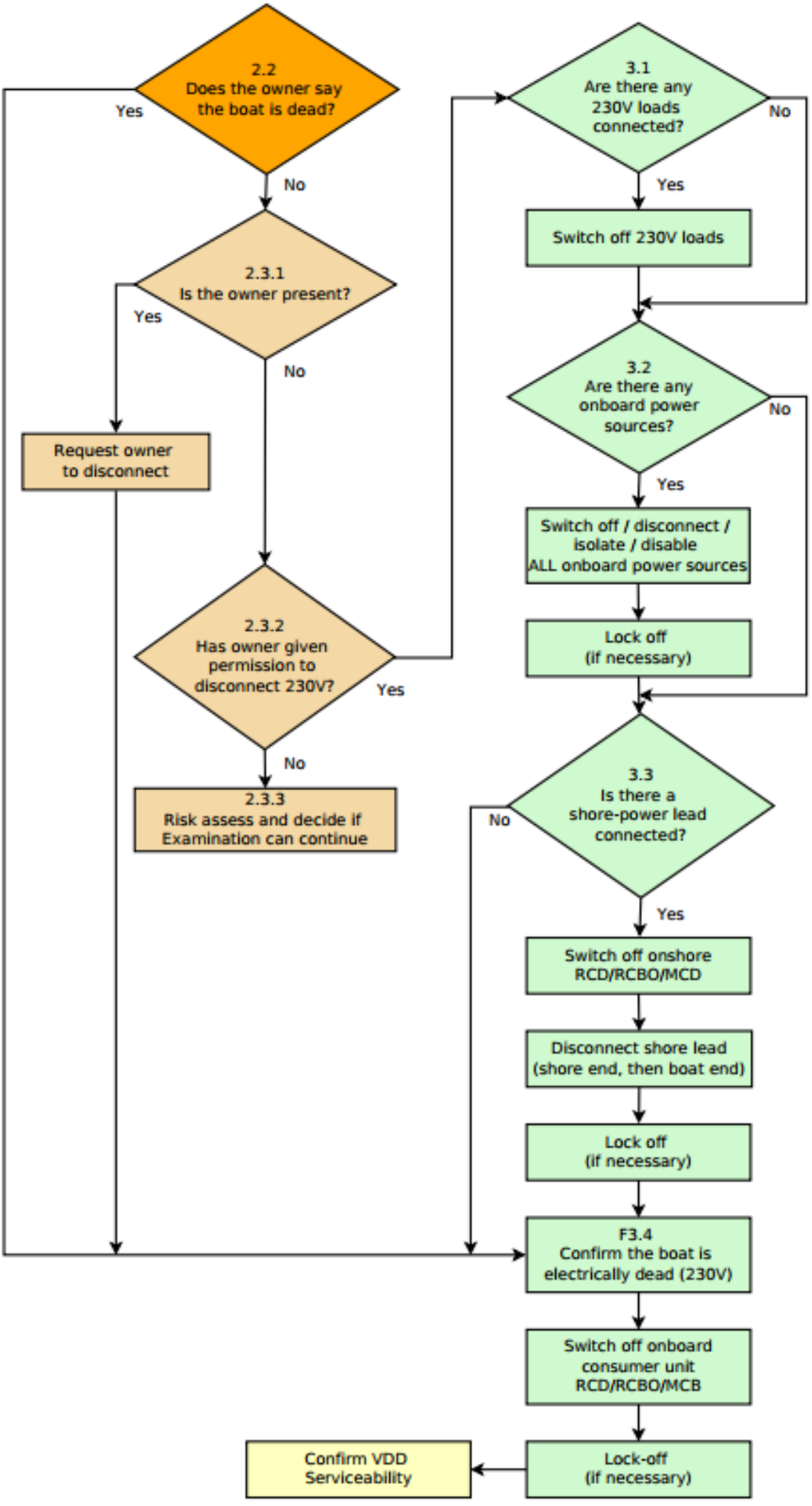
Key points regarding this process which Examiners should have written in their Examination Agreement with Owner are that the owner should confirm:

- all 230V AC power sources (e.g. shore-power supplies and/or onboard power sources such as inverters and generators) and how to disconnect and re-energise
- which are the critical AC loads and how to turn them off and on
- that they are aware that the Examiner is not liable for any loss or damage, any incident or accident that may arise from undertaking the 230V disconnection or re-energisation, and that the owner retains overall responsibility for the process.

In the event the above agreements cannot be reached with an owner the Examiner should only proceed with the Examination once the boat owner or their representative can be present.

The disconnection and re-energisation Steps should be undertaken by the owner. If the owner is not present then they could be undertaken by the Examiner, as long as they have permission and enough information, and the Examiner feels safe to do so.

Flowchart of the BSS 230V AC Safe Disconnection Process



F2. On site, prior to disconnection

These Steps are to be done onsite at the boat to be Examined but before starting to perform the Examination and before the disconnection itself.

2.1 Confirm VDD serviceability

The tool Examiners are guided to use to check if the boat's electrical systems are dead or alive is a VDD. It is recommended that the Examiner has two VDDs in case one is found not to be working.

For personal safety, the two VDDs (and the 16A to 13A adapter) should be visually checked to ensure that they are complete and free from damage or deterioration before commencing with the disconnection.
If the integrity of any of these items is compromised in any way, Examiners should not undertake the 230V system disconnection using these items or perform the BSS Examination.

2.1.1 Confirm the VDD's serviceability

Examiners should confirm that the voltage detection device (VDD) is functioning correctly by plugging it into a known operational power source. This confirmation should be done once at the location of the Examination with a live 230V plug socket, regardless of when it was last checked.

To establish its serviceability, insert the VDD into a known live power source (this could include the Examiner's own portable UPS or inverter) and if the:

1. VDD illuminates then this proves that the VDD is working correctly, and the Examiner may continue with the disconnection
2. VDD does not illuminate then either the VDD is not working correctly or the 230V supply is not connected. To mitigate this issue the Examiner should:
   a. try the VDD in an alternative socket, and if still not working then
   b. check to see if any other 230V items have illuminated lights
   c. try the second VDD, and if still not working then
   d. ask the owner to confirm that the 230V is still live
   e. reconsider if it is safe to continue.

120V or 415V system is installed

Where a 120V or 415V system is installed, or there are no suitable sockets onboard into which the VDD can be used, then the BSS Office should be called for guidance.

2.2 Does the owner state that the vessel is already disconnected?

If the owner states that the vessel is already disconnected, (including that any alternative and/or auto-start 230V power sources are disconnected or disabled), then go straight to point 3.4 to confirm that the boat is electrically dead.

2.3 Is the owner present or does the Examiner have permission to disconnect?

The BSS recommend that Examiners have the owner, or their representative at every BSS Examination. However, they recognise that this is not always possible, and these Steps cover both the owner being there and not.

2.3.1 Owner is present

1. If the owner is present, then the Examiner should request that the owner:

- identifies all AC shore-power inlets, and
- identifies any other sources of AC electrical power on the boat e.g. generators and inverters.

Then the owner disconnects the 230V system(s).

2. If the owner confirms that they have disconnected the 230V system, then the Examiner should assume that the boat is still electrically alive and proceed to Step 3.4.

2.3.2 Owner 'not present' but Examiner has permission

If the owner is not present, but the Examiner has permission to disconnect the 230V and to re-energise when the Examination is complete, then the Examiner should proceed as per their 'Examination Agreement with owner'.

Before disconnecting any sources of power Examiners should consider if they have enough information, clear instructions and permission to re-energise in accordance with the owner's wishes

Equipment or an appliance is not operating as expected

If the Examiner identifies that a piece of equipment or an appliance etc is not operating as expected, the Examiner should report it to the owner before carrying out a disconnection, so that the Examiner does not become liable for any damage**.**

2.3.3 Owner not present and Examiner does not have permission

If the owner is not present and the Examiner does **not** have permission to disconnect the 230V then the Examiner should:

- assume that the 230V is live and not disconnected, and
- reconsider if it is safe to continue with the BSS Examination.

2.4 Proceed with caution

Until the boat is established to be electrically dead, always **proceed with caution**.

Expect to find alternative connected power sources e.g. shore-power, generators and inverters including generators/inverters with auto start facilities.

Lone working safe practices, in this context, includes ensuring someone knows the duration of the Examination and the location of the boat so that they can raise help if the Examiner does not confirm that they are safe by the time the Examination is due to end.

If the Examiner does not feel safe at any stage of the disconnection process, then they should stop and:

- gather more information
- decide if they are competent to calculate the level of risk
- and if they feel unsafe in anyway then they should stop and not perform the Examination.

F3. Disconnection Process

These Steps are the disconnection itself and to be done after the VDD's serviceability has been confirmed and the instructions for disconnection and re-energising are clear and confirmed by the owner. Most of these Steps are in the flowchart.

3.1 Are there any 230V loads connected onboard the boat?

If there are any 230V loads connected that require shutting down before disconnecting the power, then:

a. before disconnecting anything, using the VDD confirm that a selection of sockets is live. A selection could be described as port, starboard and in each accommodation space with power sockets.

b. switch off all the boat's 230V electrical **appliances,** equipment, and devices. **Leave sockets Live.**

3.2 Are there any onboard 230V power sources present?

If there are any onboard 230V power sources present, then:

a. disconnect all onboard power sources e.g. generators and inverters, including generators/inverters with auto start facilities

b. if these power sources cannot be disconnected then the boat will not be able to become electrically dead, and in these circumstances before undertaking the BSS Examination, the Examiner should reconsider if it is safe to continue.

Not all inverter DC supplies will be routed through a battery isolation switch. In such cases disconnection of the (AC) output will be achieved solely by switching the inverter's 'on/off' switch to 'off'.

Where inverters are fitted, wait at least 5 minutes after disconnecting the shore-power and/or the inverter before continuing, otherwise a danger of electrocution may be present.

3.3 Is there a shore-power lead connected to the boat?

3.3.1 If there is a shore-power lead connected to the boat then

a. switch off onshore RCD / RCBO / MCB, and then

b. disconnect the shore-power lead shore-end first and then boat-end second

c. if it is practical then coil the shore-power lead and put it inside the boat

d. where needed implement additional techniques to prevent inadvertent reconnection.

Note: on rare occasions there may be two shore-power leads

Examiners should be aware that shore-power leads tend to deteriorate and then fall apart, and therefore Examiners must proceed with caution before disconnecting.

3.4 Confirm the boat is electrically dead

Once the Examiner believes that all sources of 230V have been disconnected, then the Examiner needs to confirm that the boat is 'electrically dead'.

3.4.1 Use VDD to confirm if the boat is electrically dead

Insert the VDD into a selection of the boat's 230V sockets to confirm they do not have power to them, and therefore are dead. Examiners may choose to test the same sockets as used at Step 3.1 prior to disconnection, in case they are testing for live power in a socket which is not normally in service.

3.4.1.1 If the VDD does not illuminate – check in a live 230V source

If the VDD does not illuminate, then either the VDD is not working correctly or the 230V supply is not connected.

To be certain that the boat is dead then the **VDD's serviceability needs to be confirmed** by checking it in a live 230V known source.

3.4.1.2 If the VDD does illuminate

If the VDD does illuminate, then safe disconnection has **not** been achieved. In such circumstances:

a. go back to the start of Step F3, and request that the boat owner reassesses the possible additional sources of AC electrical power.

b. If the disconnection has been unsuccessful on a number of consecutive attempts, then the Examiner should consider if it is safe to continue with the BSS Examination.

3.4.2 Switch off onboard consumer unit

a. where there is an AC consumer unit with RCD / RCBO / MCB installed within the boat, switch off the main RCD / RCBO / MCB isolator switch

b. the consumer unit can be locked off at this point to prevent inadvertent reconnection, if necessary.

F4. Perform the BSS Examination

Once the boat has been proven dead, the Examiner can proceed with the BSS Examination.

Boat cabin lights normally operate on 12V DC, or 24V DC and so the Examiner should still be able to see to safely complete the Examination, however if not then a torch can be used. Therefore, it is recommended that all Examiners carry a torch in their standard Examination tool kit.

F5. Re-energisation

Once the BSS Examination is complete, then re-energisation should be considered, as long as there were no issues found which would prevent a safe re-energisation.

5.1 Is the owner present or has the Examiner got permission to re-energise?

5.1.1 Owner is present

If the owner is present, then the Examiner should request that the owner re-energises as per the process in Step 5.3 below.

The Examiner does not need to wait onsite until the re-energisation is complete, though they of course may choose to. Note that it is not the Examiner's responsibility to resolve any re-energisation issues.

5.1.2 Owner not present but Examiner has permission to re-energise

If the owner is not present, but the Examiner has permission to re-energise, preferably in writing, then the Examiner should proceed as per the 'Examination agreement with owner', which may include reconnecting any 230V loads (appliances etc.) that were turned off before the 230V was disconnected.

If the electrical systems do not re-energise as expected, then the Examiner should follow the Steps agreed with the owner in the 'Examination agreement with owner'.

5.1.3 Owner not present and Examiner does not have permission

If the Examiner decided to go ahead with the Examination (because the boat was already electrically dead, or the risk assessment showed that it was safe to do so), even if the owner did not give permission to disconnect or re-energise, then Examiners should not reconnect or re-energise any part of the electrical systems.

5.2 Safely re-energising the electrical system(s)

If, during the BSS Examination, a Warning Notice was issued at ECP Check 3.9.1 'Is it impossible to connect simultaneously more than one power source to the AC distribution system?', it is strongly recommended that Examiners do not to re-energise the 230V systems themselves, nor should they support the owner to do so.

Examiners should leave the 230V system de-energised. If the owner is not present, then they should be notified that the system is not energised.

5.3 The process of re-energising

Once the BSS Examination is complete, and provided an electrical related Warning Notice has not been issued, the boat's electrical systems (AC, and DC to AC inverters) may need to be re-energised.

It is recommended that the owner re-energises.

The recommended re-energisation process:

1. Refer to the owner's reconnection process as per the 'Examination agreement with owner'
2. Reconnect the shore-power lead (boat-end first and then the shore-end second), as long as the shore-power lead and connectors are not subject to a BSS Warning Notice at ECP Check 3.8.1, or Check 3.8.2 or Check 3.8.3
3. Remove the lock-off device if fitted at Step 3.3.d from the onshore RCD / RCBO / MCB isolator switch

4. Switch on any onshore RCD / RCBO / MCB
5. If the boat has a consumer unit with RCD / RCBO / MCB, then:
    a. Remove any lock-off device fitted at Step 3.1.d from the main RCD / RCBO / MCB isolator switch, if installed
    b. Switch on the main RCD / RCBO / MCB isolator switch
    c. Re-establish all AC loads switched off at Step 3.1.a, b and c.
6. Re-energise all onboard power sources e.g. generators and inverters, including generators/inverters with auto start facilities switched off at Step 3.2.a.

5.4 Confirm successful re-energisation using the VDD

To ensure that the 230V system re-energisation has happened correctly, use the VDD in the same sockets as tested before disconnection, as described at '3.4.1 VDD to confirm if the boat is electrically dead'.

If the VDD does illuminate, then this is confirmation that the socket is live.

If the VDD does not illuminate, then see '2.1.1 Confirm the VDD's serviceability' and if the VDD is found to be serviceable, then repeat the process from 5.3.

The Examiner may also check for the illumination of indicator lights on 230V equipment.

Equipment or an appliance is not operating as expected

If the Examiner identifies that a piece of equipment or an appliance etc is not operating as expected, the Examiner should report it to the owner before leaving the boat or as soon as practical, so that the Examiner does not become liable for any damage**.**

G Appendix – Disabled, Decommissioned Or Disconnected Systems

The information below provides guidance to Examiners on how to apply the Examination Checking Procedures to disabled or decommissioned or disconnected systems or equipment, or systems that appear to have components or appliances removed or missing (v1.0 June 2012).

1.0	**Introduction**
1.1	Guidance to BSS Examiners about making sure in advance of the examination that the owner presents the vessel with water, gas, and electrical systems in working order and with all required items capable of being checked effectively, is covered in the 'pre-examination' section.
1.2	The purpose of this particular note is to provide guidance covering those situations where, during an examination, systems, system components, appliances or items which are the subject of BSS Checks are not present, disabled or decommissioned or disconnected. The aim of the note is to help ensure that full and complete BSS Examinations can be carried out.
1.3	The guidance is relevant to the following circumstances: • systems components, engines, appliances or other items subject to BSS Checks that appear to have been removed or are missing, but a fuel supply is in place; • systems, system components, engines, appliances or other items, subject to BSS Checks are being worked on or are disconnected, unfinished or in some other way non-functioning; • where the owner is seeking to retain a disconnected or permanently disabled or decommissioned engine or appliance.
2.0	**Pre BSS Examination Guidance to Owners**
2.1	Owners are responsible for preparing their vessels for a BSS Examination. It is in their interests to do this as diligently as possible so as to keep to a minimum the time necessary for an examination to be carried out.
2.2	It is essential that, as part of an Examiner's ordinary procedures when making arrangements for BSS Examinations with an owner or their representative, owners are reminded that BSS Certificates cannot be issued unless a vessel is fitted with at least one complete system e.g. a propulsion engine and its fuel supply, and verified as being compliant in accordance with the BSS Examination Checking Procedures.
3.0	**Accepted principles**
3.1	Unless covered specifically in the detailed guidance in section 4 below the following accepted principles apply if the circumstances as described at 1.3 are encountered: • The BSS examination and BSS Certificate issue represents a 'snapshot in time' and it is accepted that boats may take a very long time to fully fit out, and will undergo refits and modifications throughout their lives. • BSS Certificates cannot be issued unless a vessel is fitted with at least one complete system e.g. a propulsion engine and its fuel supply, and this verified as being compliant in accordance with the BSS Examination Checking Procedures. • Boat owners are responsible for making the boat available in a condition that can be examined, including the vessel having water, gas, and electrical systems in working order, sufficient to ensure that all required items subject to examination are capable of being checked effectively. There is no evidence to suggest that part finished boats or boats undergoing refit present a heightened risk of fire or explosion. • Items that are not present to examine cannot be examined. • Boat owners are responsible to ensure that any changes they make in between examinations are to the BSS Requirements. This work is assessed at the next BSS examination. • Redundant pipework or wiring found on board but confirmed as not connected to a supply or appliance should be ignored for the purposes of the BSS

4.0	**General approach**
4.1	Unless covered specifically in the detailed guidance in Section 5 below, the following general approach applies if the circumstances as described at 1.3 are encountered: Items such as engines, appliances or their component items or systems found not present, disconnected, disabled or decommissioned can be considered as 'not present' for the purposes of the BSS examination if: a) the item is removed from the boat; **or,** b) the item is in fact or is made 'inactive' and to make it active again will require re-connection, replacement or modification of such items using tools. * defined as not functioning or operating; out of use.
4.2	Where the above general approach has been applied and for the purposes of recording examinations, the engine/appliance or system is to be recorded as 'not present' and a note of the circumstances must be retained with the examination record.
4.3	In the event the above guidance does not give full clarity, seek advice from the BSS Office.
5.0	**Guidance specific to particular items or circumstances**
5.1	**5.1.1 Batteries** Boats which are provided with arrangements for the installation of engine start and/or domestic batteries must have their batteries installed at the time of any BSS Examination. Where the required batteries are found not to be fitted an Examination cannot be completed until batteries have been installed and the relevant Checks can be carried out, unless guidance has been taken from the BSS Office.
	5.1.2 Electrical wiring In the event electrical wiring is found not connected to electrical equipment but is confirmed as connected to the distribution/fuse box, any examination cannot be completed: • unless the electrical equipment has been properly connected to an appliance or terminal block or other proprietary connector; or, • unless the electrical wiring has been completely removed back to the distribution/fuse box. [Note removal of a fuse or circuit breaker does not constitute making the circuit inactive] • unless guidance has been taken from the BSS Office.
5.2	**LPG Systems and Appliances**
	5.2.1 Gas appliances found but no cylinder or cylinder locker and/or no supply pipework. Boats which have a gas appliance(s) but no cylinder or cylinder locker or obvious location for open cylinder stowage and possibly no supply pipework, must be treated cautiously because of the potential for cylinders to be subsequently located inside the accommodation space not in a locker. In these circumstances a BSS Examination cannot be completed: a) until the LPG cylinders and supply pipework is in place or the gas appliance is removed; **or,** b) unless guidance has been taken from the BSS Office.
	5.2.2 Non-compliant LPG fridges on petrol engine boats Non room-sealed dual (electric/LPG) fuelled refrigerators installed in boats with petrol propulsion engines may not be provided with any LPG supply pipework unless the burner, combustion air and exhaust arrangements comply with the BSS Requirements. In the event that a non-compliant LPG dual-fuel refrigerator is retained by the owner for use solely with electric or as storage, examinations may only be completed when any fridge LPG supply pipework and/or hose is removed at least to the branch 'T' joint with the supply line. The T-joint should ideally be replaced with an in-line or elbow joint or the pipe replaced with a continuous length. The use of a stop-end to a short length of supported spur pipe is acceptable

2 Appendix – ECP Part 2 – Supporting Information

Permanently installed fuel systems and fixed engines

1 – Essential material needed by BSS Examiners to be able to apply certain Part 2 Checks

1.1 Kerosene, Paraffin and Petroil

The BSS Requirements apply to kerosene and paraffin installations in the same way they do for diesel installations. Therefore, during BSS Examinations Examiners must apply the Checks to kerosene or paraffin installations as if they were diesel installations.

The BSS Requirements apply to petroil engines in the same way they do for petrol engines. Therefore, during BSS Examinations Examiners must apply the Checks to petroil engines if they were petrol engines.

See further information at section 2.1 covering the characteristics of kerosene, paraffin and petroil.

1.2 Vintage and unusual engine types

Vintage marine engines may be fuelled by spark-ignited paraffin, or a combination of petrol and paraffin. In the event Examiners are unsure as to how to apply the BSS Requirements to such engines they should contact the BSS Office for guidance. The same applies to any other marine engine that is not obviously fuelled by petrol or diesel.

1.3 International symbols (for fuel types)

At Check 2.1.1 it is acceptable for fuel filling points to be marked with an appropriate internationally recognised fuel symbol (from ISO 7000 – Graphical symbols for use on equipment) rather than words describing the fuel type. The three most common symbols are shown below:

Petrol

Unleaded petrol

Diesel

Examiners are not required to determine the type of petrol in use (e.g. whether it's unleaded) and so do not have to determine whether the correct petrol symbol is present.

1.4 Fuel tanks – unsuitable materials

The Requirement at Check 2.5.2 specifies that fuel tanks must not be made from obviously unsuitable materials.

Materials obviously unsuitable for diesel include:

- Plastic tanks that are not 'CE' marked or otherwise recognised as being suitable (see item 1.5, below)
- Copper based alloys (e.g. brass)

Materials obviously unsuitable for petrol include:

- Plastic tanks that are not 'CE' marked or otherwise recognised as being suitable (see item 1.5, below)
- Mild steel
- FRP/GRP

1.5 Fuel tanks – plastic tank suitability

All fuel tanks intended for use in recreational craft within the scope of the Recreational Craft Directive must carry a 'CE' marking of conformity. They are also likely to be marked 'ISO 21487' (the RCD harmonised international standard for permanently installed petrol and diesel tank construction).

Plastic tanks marked in this way are compliant with the Requirement at Check 2.5.2.

Plastic tanks intended for use in boats outside of the scope of the Recreational Craft Directive may also be accepted as being compliant at Check 2.5.2 if they have been manufactured to alternative appropriate specification. Most standards or codes relating to marine fuel tanks include a clause requiring the product to be marked with the manufacturer's details, fuel type(s) for which the tank is suitable, design capacity, test pressure and the standard or code number.

An example of an acceptable alternative to CE marking under the RCD is the US Coast Guard Code of Federal Regulations (CFR) Part 183.510 of 33 CFR, subpart J. Conformity with this code can be determined by a visual inspection of the tank manufacturer's plate, which should refer to the CFR Part 183.510, or any one of the following voluntary codes:

- American Boat and Yacht Council (ABYC) H24 and H33. (N.B. H33 refers to diesel systems and stipulates the same procedures as for petrol systems).
- American National Standards Institute/Underwriters Laboratories (ANSI/UL) 1102.1991.
- National Fire Protection Association (NFPA) fire protection standard for pleasure and commercial motor craft - NFPA 302.

Plastic tanks marked with any of the above are compliant with the Requirement at Check 2.5.2.

Where Examiners come across plastic tanks that are not CE marked to the RCD, or not marked with one of the alternative acceptable standards/codes listed above, they should contact the BSS Office for guidance.

1.6 Fuel tanks – plastic tank damage or deterioration

'Damage or deterioration' (ECP Glossary term) is that materially affecting, or likely to affect, the integrity, efficiency, or operation of an item or device. The following are indicators of damage or deterioration on plastic fuel tanks:

- Chafing, irregular indentations or punctures
- Signs of corrosion attack (such as softening or environmental stress cracking)

  Softening indicates corrosive attack by the fuel causing the fuel to permeate the plastic or tank gasket material. The physical properties of the material will progressively degrade and may ultimately lead to tank failure or fuel leaks. The presence of softening would indicate that the tank is not being used in accordance with its intended purpose.

  Environmental stress cracking may develop should the tank be subject to tension or bending stress beyond its design tolerance and over prolonged periods. Environmental stress cracks may cause fuel leaks.

Potential areas of stress cracking can be:

- adjacent to a tank spigot
- next to a means to restrain the tank
- around a tight radius in the moulded tank surface.

Any form of damage or deterioration on a plastic tank must be considered non-compliant (at Check 2.5.3) and unsafe.

1.7 Internal combustion engines housed in proprietary cocoons

Examiners are not required to apply any of the Part 2 Checks to internal combustion engines housed within the original equipment manufacture's cocoon – see the examples below. However, as described in the Applicability at Check 2.15.1, for such arrangements the engine mounting Requirements apply to the cocoon's mounting system where this can be seen on the outside of the cocoon.

Examples of internal combustion engine housed within the original equipment manufacturer's cocoon

2 – Additional information to support BSS Examiners' understanding of the BSS Requirements

2.1 The nature of petrol, petroil, diesel, kerosene and paraffin

Petrol

Petrol has a lower flashpoint of less than 0°C which makes it an 'extremely flammable' liquid. At normal environmental temperatures in the UK petrol therefore evaporates easily and quickly into the atmosphere. The vapours given off are three to four times heavier than air and will therefore sink to the lowest level of their surroundings (e.g. in cockpits, cabins, lockers and bilges).

For petrol vapour to ignite in air, the mixture of vapours must fall within certain concentrations, known as the flammable range (further defined as the upper and lower explosive limits). For petrol concentrations below 1.4% in air the mixture is too lean to ignite, and for those above 7.6% the concentration is too rich. At all concentrations between these two limits, a mixture of petrol vapour and air will burn. Hence whenever petrol vapours are released, although they may be too rich initially to burn, they will always pass through the flammable range to give a mixture that is capable of being ignited before they are eventually diluted to safe levels. If vapour within the flammable range is present in a confined space an explosion will result from ignition.

How long flammable concentrations of vapours persist and how far they travel before being diluted to a safe level will depend on the rate of release of the vapours and the level of ventilation acting to disperse them.

Petrol vapours will not only be released from any spilt product but, because of the ease with which it evaporates, they are released in significant quantities whenever petrol is handled, dispensed or transferred from one container to another. As a consequence of the flammable limits, petrol vapour when diluted 70-fold with air will still give rise to a flammable mixture and it can be calculated that one litre of petrol can, on evaporation, give rise to approximately 15 cubic metres of a flammable petrol/air mixture.

Petroil

Petroil is petrol to which has been added a small proportion of oil, used as a combined fuel and lubricant in some two-stroke engines. The nature of petroil is very similar to that of petrol, and therefore the risks associated with its use are also very similar. For the purposes of the BSS Requirements petroil and petroil engines are assessed in the same ways as petrol and equivalent petrol engines. Petroil is sometimes referred to as 'premix'.

Diesel

Diesel has a lower flashpoint of approximately 50°C, which makes it a 'flammable' liquid. This reasonably high flashpoint means that at normal environmental temperatures in the UK diesel does not evaporate into the atmosphere. This means that diesel is considered as a relatively low volatile fuel and as such does not need the same controls in place to reduce the chance of ignition as is the case with more volatile petrol.

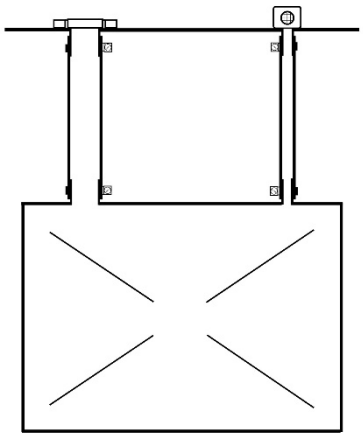
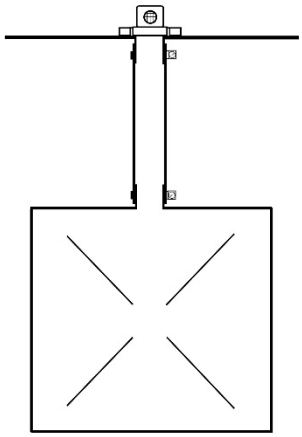
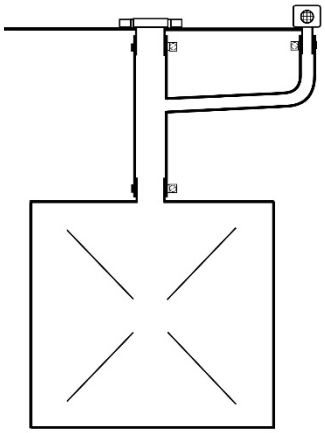
Kerosene and paraffin

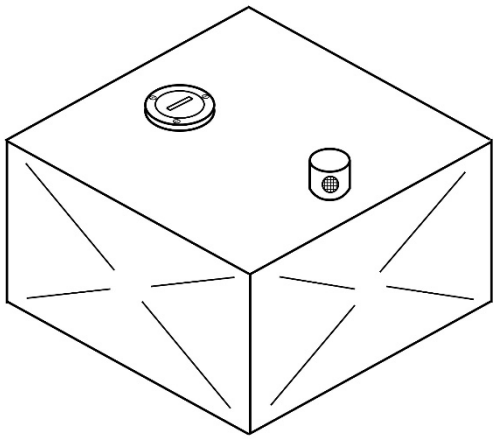
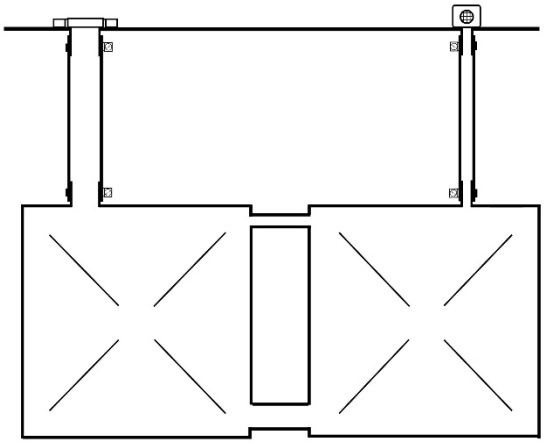
Kerosene and paraffin are very similar fuel oils, and in the UK kerosene is often referred to as paraffin. In general terms paraffin is a more refined and distilled version of kerosene. Paraffin also usually contains additives that help reduce the odours given off by kerosene. In the UK kerosene is widely used as domestic heating oil.

Kerosene has a flashpoint of approximately 40°C, which makes it a 'flammable' liquid. So as with diesel, this reasonably high flashpoint means that at normal environmental temperatures in the UK kerosene does not evaporate into the atmosphere and therefore does not need the same control in place to reduce the chance of ignition as with petrol.

2.2 Fuel tank vent facility arrangements

At Check 2.3.1 a vent line must be fitted to each fuel tank, or a vent must be fitted to either the filling cap, filling line or tank top. The following drawings are intended to add clarity to the different acceptable arrangements that Examiners are likely to come across.

		
1. Vent line fitted to tank top	2. Vent fitted to filling cap	3. Vent line fitted the filling line

	
4. **Diesel** tanks of less than 30lt capacity may be installed with the filling point on the top plate of the tank provided there is no risk of unseen spillage. On such tanks the vent outlet may be mounted on the tank top (as shown), fitted to the filling cap, or a vent line may be installed to raise the height of the vent outlet.	5. On multiple **diesel** tank arrangements tanks may share a vent facility. However, the vent line connecting the tanks must be connected at the highest point on the side of the tanks and must be routed and supported in such a way that it cannot retain fuel.

2.3 Petrol tank vent outlet suitable proprietary flame arrestors

At Check 2.4.2 petrol tank vent outlets must be fitted with a suitable proprietary flame arrestor. Examiners must be careful not to mistake a water tank vent outlet for a suitable proprietary flame arrestor. Some water tank vent outlets are provided with a course mesh to restrict debris and insect ingress which is not fine enough to act as a flame arrestor.

Water tank outlet with a mess of less than 11 wires/cm

Proprietary flame arrest with a mesh of exactly 11 wires/cm

Proprietary flame arrest with a mesh with a mesh of greater than 11 wires/cm

Permanently installed fuel systems and fixed engines

BSS Requirements for diesel leak-off (a.k.a. spill lines, spill rails and spill racks) arrangements (Check 2.10.5).

Primary compliance option

When checking diesel leak-off arrangements Examiners should start by applying the relevant Checks at 2.10.1-4 and 2.11.1-3. If the individual fuel lines and connections that make up the leak-off rack comply with the relevant Checks at 2.10.1-4 and 2.11.1-3 the leak-off arrangements are compliant at Check 2.10.5.

Alternatively, if the individual fuel lines and connections that make up the leak-off rack do not comply with the relevant Checks at 2.10.1-4 and 2.11.1-3 the leak-off arrangement may achieve compliance using one **or more** of the following three options:

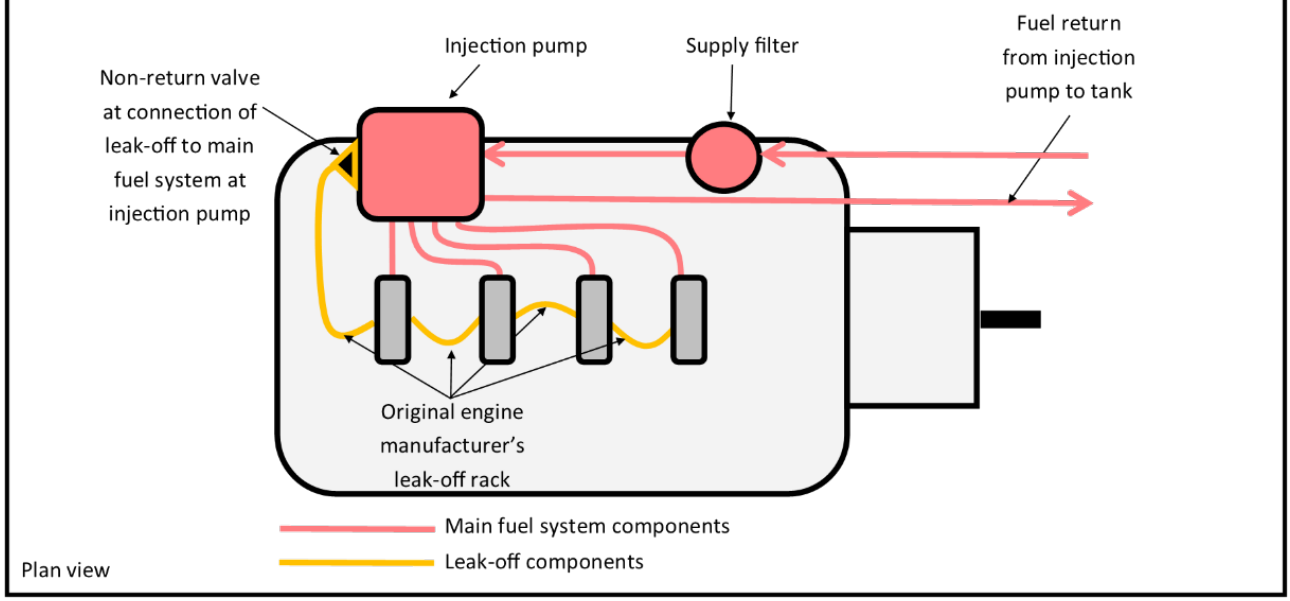
Alternative compliance options

Option 1 – Fuel within the leak-off rack returns to the main fuel system on the engine through non-return valve

To achieve compliance using Option 1, the leak-off rack must be connected to the main fuel system on the engine through a non-return valve. (Such a non-return valve will stop fuel from the main fuel system entering the leak-off rack.) The following Requirements also apply:

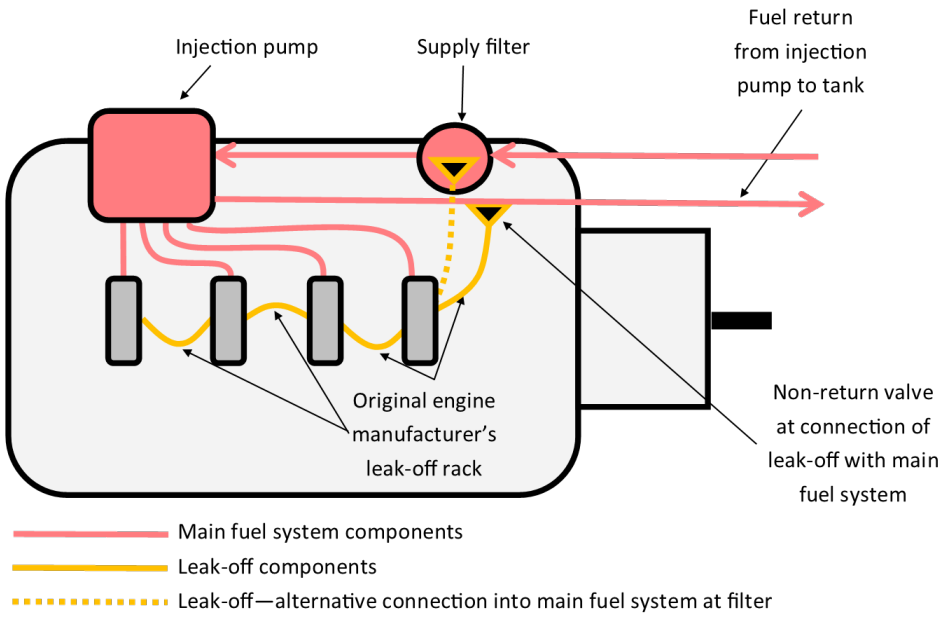
- The leak-off components must all be original to the engine; and
- The leak-off components must be free of signs of leaks, damage or deterioration.

Figure 1a - Leak-off returns to main fuel system on the engine through non-return valve



Example 1 – Figure 1a shows an example of an arrangement compliant with Option 1. The leak-off rack connects into the main fuel system at the injection pump through a non-return valve.

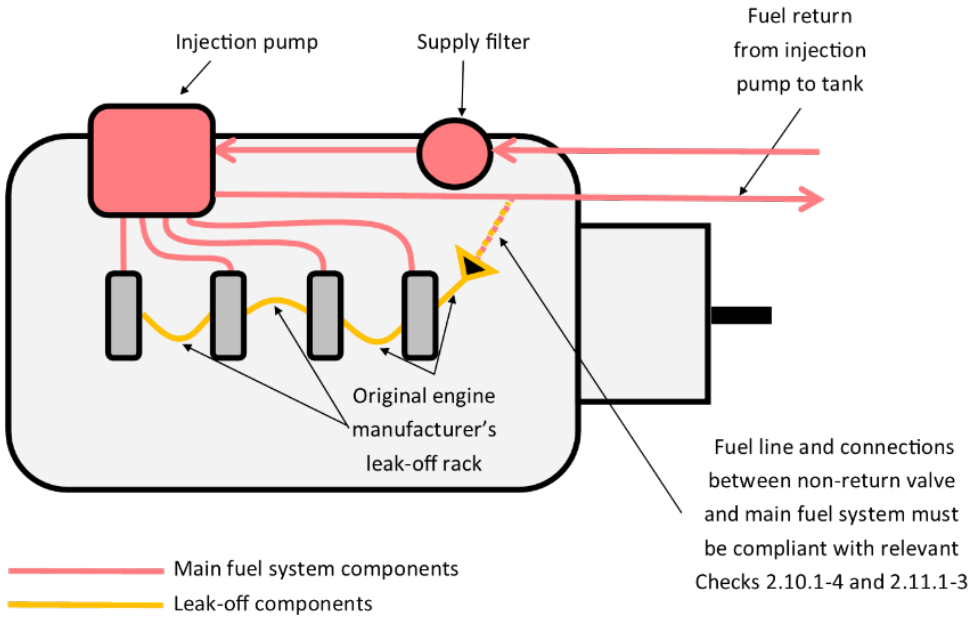
Figure 1b - Leak-off returns to main fuel system on the engine through non-return valve



Plan view

Example 2 – Figure 1b shows two further examples of a leak-off rack compliant with Option 1. The main drawing shows the leak-off rack connecting into the main fuel system with a non-return valve on the return line from the injection pump to the tank. The yellow-dotted line shows the leak-off rack connecting into the main fuel supply with a non-return valve at the supply filter.

Figure 1c - Leak-off returns to main fuel system on the engine through non-return valve



Plan view

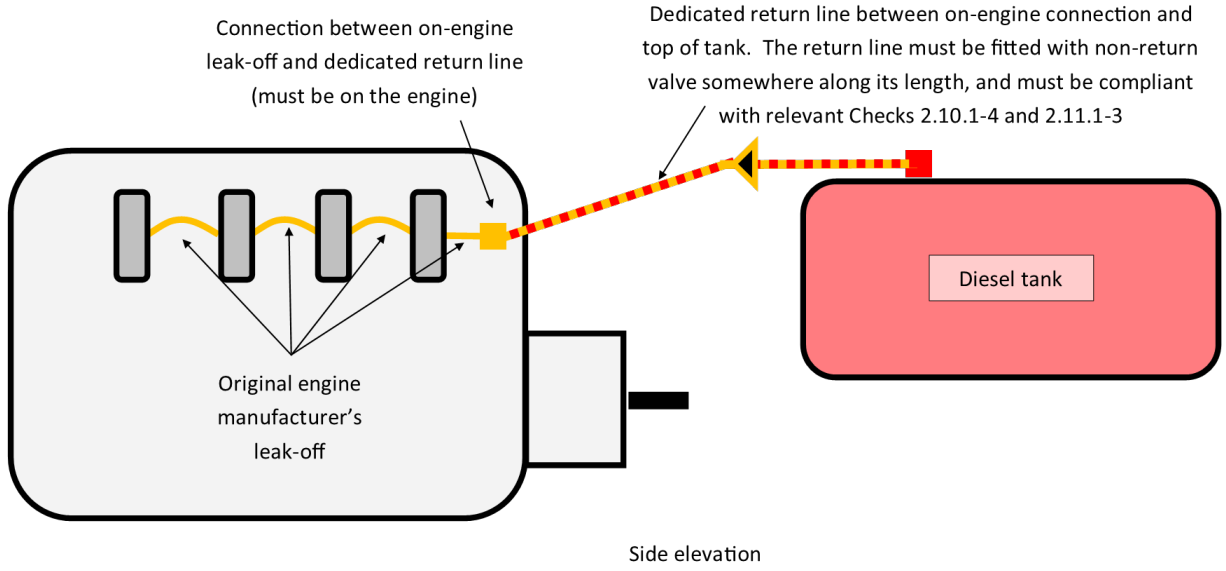
Example 3 – Figure 1c shows a further example of a leak-off rack compliant with Option 1. Here the non-return valve is in the fuel line between the final injector and the injection pump return line to the tank. The fuel line between the final injector and the non-return valve is part of the original engine leak-off arrangement. However, as the non-return valve only protects the leak-off arrangements upstream of it, the fuel line between the non-return valve and the connection into the main fuel system must be compliant with the relevant Requirements at Checks 2.10.1-4 and 2.11.1-3.

Option 2 – Leak-off returns to the tank through a non-return valve

To achieve compliance using Option 2, the on-engine leak-off rack must be connected directly to the top plate of the tank by a dedicated fuel return line. A non-return valve must be installed in the return line to prevent fuel from the tank syphoning back into the on-engine leak-off rack. (The non-return valve may be located at any point along the fuel return line.) The following Requirements also apply:

- The leak-off rack on the engine must all be original to the engine; and
- The leak-off rack components must be free of signs of leaks, damage or deterioration; and
- The connection between the original on-engine leak-off rack and the dedicated return line must be made on the engine; and
- The dedicated return line including its connections to the on-engine leak-off rack and the tank must be compliant with Checks 2.10.1-4 and 2.11.1-3.

Figure 2 - Leak-off returns to tank through non-return valve



Option 3 – Leak-off returns to the tank by gravity

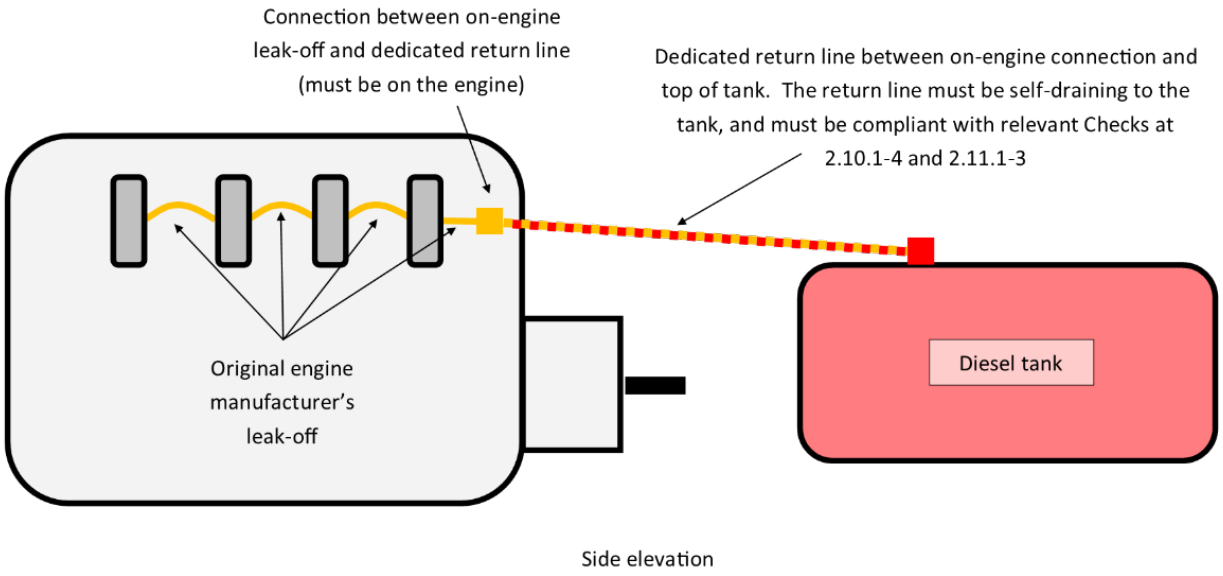
To achieve compliance using Option 3, the leak-off must be connected directly by a dedicated fuel return line to the top plate of the tank, with the tank connection being below the level of the leak-off connection on the final injector. The fuel return line must be self-draining from the aft injector to the tank.

Such an arrangement will prevent fuel from the tank syphoning back into the leak-off rack.

The following Requirements also apply:

- The leak-off rack on the engine must all be original to the engine; and
- The leak-off rack components must be free of signs of leaks, damage or deterioration; and
- The connection between the original on-engine leak-off rack and the dedicated return line must be made on the engine; and
- The dedicated return line including its connections to the on-engine leak-off rack and the tank must be compliant with Checks 2.10.1-4 and 2.11.1-3.

Figure 3 - Leak-off returns to tank by gravity



Side elevation

Permanently installed fuel systems and fixed engines

BSS Requirements for steam engine pressure system inspection certificates (Check 2.16.1)

The inspection certificate is actually a detailed report of an examination of a pressure system which may involve a number of stages and tests and the report may be issued in two parts.

There is no set format for the report although HSE does publish a model form, the reports are issued by organisations (often an insurance company) and professional independent competent persons.
In all cases the reports will be signed by a person with a title such as:

- tester
- examiner
- inspector
- surveyor
- engineer surveyor.

A report will be issued whatever the state of the boiler as its purpose is to tell the owner what is wrong as well as what is right. The existence of a report does not mean, therefore, that the boiler is in a satisfactory state to be used, so it must be read carefully.

Report Assessment

You must be assured of the following:

- has the examination been carried out by a competent person; and,
- does the report indicate satisfactory condition?

Competent Person

Any person issuing a report on behalf of one of the following may be accepted as competent:

- insurance companies
- plant examination firms
- SBA Services Ltd
- Northern or Southern Federations of Model Engineering Societies

In the case of other organisations or persons the report is signed by a person of the appropriate designation.

In cases of doubt it may be necessary to refer to the manager of the Boat Safety Scheme.

Satisfactory Condition

The indications of satisfactory condition to look for in the report are as follows:

- the examination was carried out in two stages
- the report applies to the boat in question
- date of examination(s); and,
- terminology

Two-Stage Examination

The boiler must first be examined cold before it is examined under steam at normal working pressure.

The two examinations may have been done on the same date or they may have been done on separate dates, and they may be reported on a single form or on two - one for each examination.

It is essential to establish that both examinations have been carried out.

Name Of Boat

The name of the boat in question must appear on the report.

Note that some boilers are inspected out of the boat and the boat name is sometimes omitted by the boiler tester.

Date Of Examination

Reports are only valid for 14 months following the date of the latest examination. The only exception is where the report states a 'run-out' date in which case it is valid up to that date.

Where the examination has been done in two parts the examinations must not be separated by too long a period. There is no maximum, but it is recommended that the examinations are done within 3 months of each other. Where the separation is longer, the Examiner must seek an explanation.

Terminology

The report must be carefully checked for words or statements such as:

- satisfactory/unsatisfactory
- in order/not in order
- repairs required.

3 Appendix – ECP Part 3 – Supporting Information

Electrical systems

1 – Essential material needed by BSS Examiners to be able to apply certain Part 3 Checks

1.1 Check 3.1.1 – Unsealed and open-vented batteries

All lead-acid type batteries (wet lead-acid and valve regulated lead-acid (including Gel and Absorbent Glass Mat batteries)) must be considered as being 'unsealed or open-vented', unless the boat owner is able to provide documentary evidence that they are 'sealed' in the context of hydrogen and oxygen emissions (not in the context of whether they need topping up with electrolyte).

For all battery types other than lead-acid, Examiners must assume they are 'unsealed or open-vented' unless the boat owner is able to provide documentary evidence that they are 'sealed' and do not require ventilation.

1.2 Check 3.5.3 – DC charge circuits connected directly to battery terminals or to the unswitched side (battery) side of battery isolators.

How to determine whether DC charge circuits bypass a battery isolator

On most battery installations the battery isolator(s) will be connected in the positive side, but on a very small number of installations (mainly on older boats) the isolator(s) will be connected in the negative side. The approach Examiners should take in order to determine whether charge cables are connected directly to the batteries or to the unswitched (battery) side of the isolator(s) is slightly different depending on whether the battery isolation is in the positive or negative side of the battery.

a. Battery isolator(s) connected in the positive side

As shown by the drawing below (Fig 1), where the battery isolators are in the positive side, Examiners must look for cables from the charge source(s) connected to the positive battery terminals and, where they can be seen, for such cables connected to the unswitched (battery side) terminal on the battery isolator(s). For a charge circuit to be present there does not have to be a visible negative charge circuit cable e.g. to a corresponding negative battery terminal; for each positive charge circuit cable there will be a cable connected to the negative side of the system somewhere, but it may not be visible at the batteries.

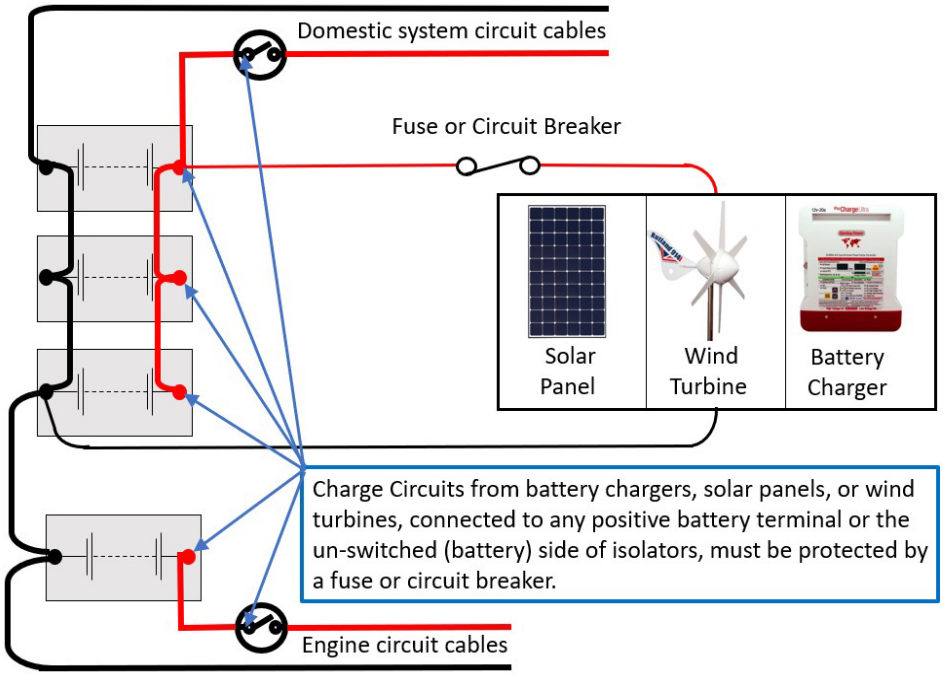


Fig 1. Battery isolator(s) connected in the positive side.

b. Battery isolator(s) connected in the negative side

It is unusual to find more than one battery isolator on a negatively isolated system. This method was common practice on older boats with simple electrical systems as it provided a single point of isolation. Although acceptable in terms of BSS compliance, negative battery isolation switching does not meet current industry installation standards.

As shown by the following drawing (Fig.2), on boats where the battery isolator(s) are in the negative side, to apply the Checking action 3.5.3 Examiners must establish whether there are charge circuit cables connected to any of the negative battery terminals. Examiners must also establish whether there are charge circuit cables connected to the unswitched connections on the battery isolator(s) where the connections can be seen.

In addition to looking for charge circuit cables connected directly to the negative battery terminals and to the unswitched (battery) side of the isolator, Examiners should look for the positive circuit cable(s) at the battery terminals. This is because it is likely that even on a negative isolated battery installation the fuse or circuit breaker in a charge circuit will be in the positive cable.

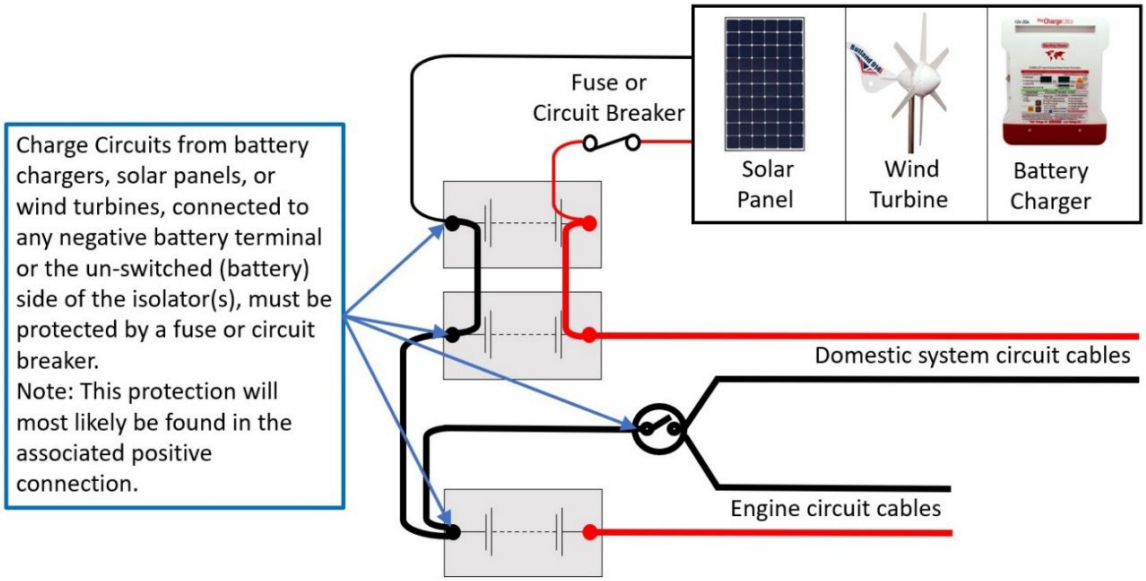


Fig 2. The battery isolator is connected in the negative side.

1.3 Check 3.6.2 – DC load circuits connected directly to battery terminals or to the unswitched side (battery) side of battery isolators.
How to determine whether DC load circuits bypass a battery isolator

On most battery installations the battery isolator(s) will be connected in the positive side, but on a very small number of installations (mainly on older boats) the isolator(s) will be connected in the negative side. The approach Examiners should take in order to determine whether load cables are connected directly to the batteries or to the unswitched (battery) side of the isolator(s) is slightly different depending on whether the battery isolation is in the positive or negative side of the battery.

a. Battery isolator(s) connected in the positive side

As shown by the drawing below (Fig 3), where the battery isolators are in the positive side, Examiners must look for load circuit cables connected to the positive battery terminals and, where they can be seen, for such cables connected to the unswitched (battery side) terminal on the battery isolator(s). For a load circuit to be present there does not have to be a visible negative load circuit cable e.g. to a corresponding negative battery terminal; for each positive load circuit cable there will be a cable connected to the negative side of the system somewhere but it may not be visible at the batteries.

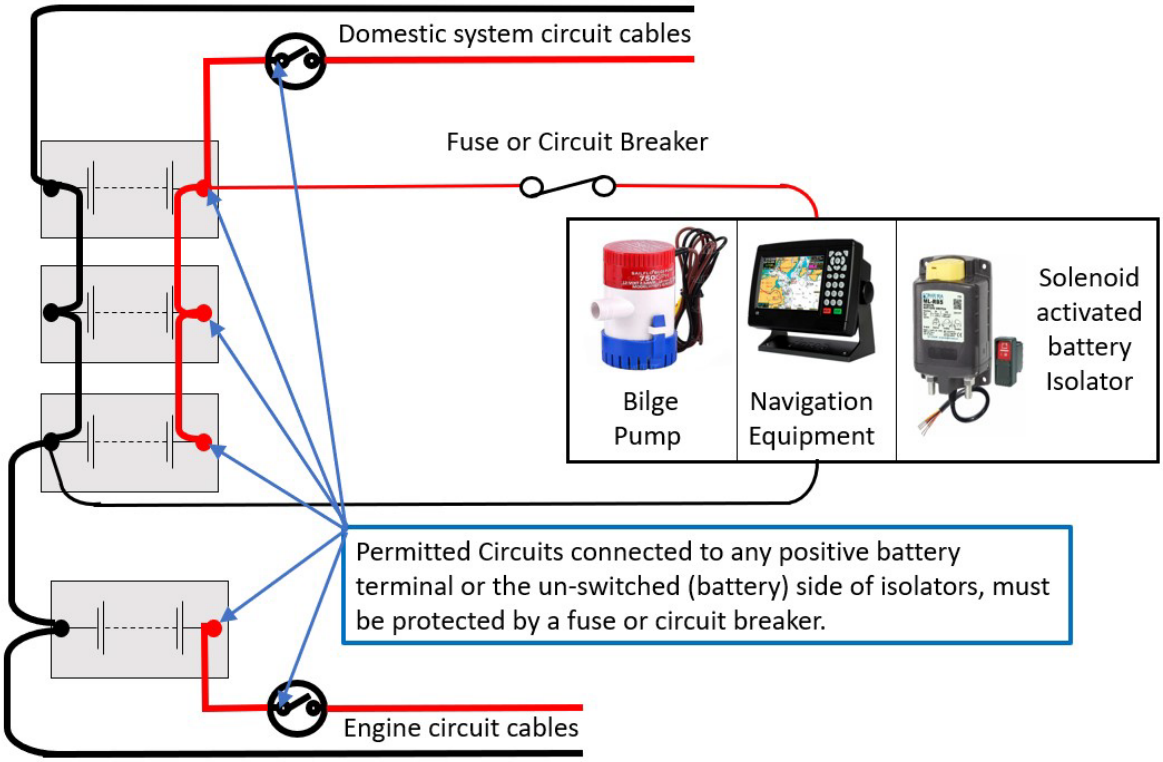


Fig 3. Battery isolator(s) connected in the positive side.

b. Battery isolator(s) connected in the negative side

It is unusual to find more than one battery isolator on a negatively isolated system. This method was common practice on older boats with simple electrical systems as it provided a single point of isolation. Although acceptable in terms of BSS compliance, negative battery isolation switching does not meet current industry installation standards.

As shown by the following drawing (Fig 4), on boats where the battery isolator(s) are in the negative side, to apply the Checking action 3.6.2 Examiners must establish whether there are load circuit cables connected to any of the negative battery terminals. Examiners must also establish whether there are load circuit cables connected to the unswitched connections on the battery isolator(s) where the connections can be seen.

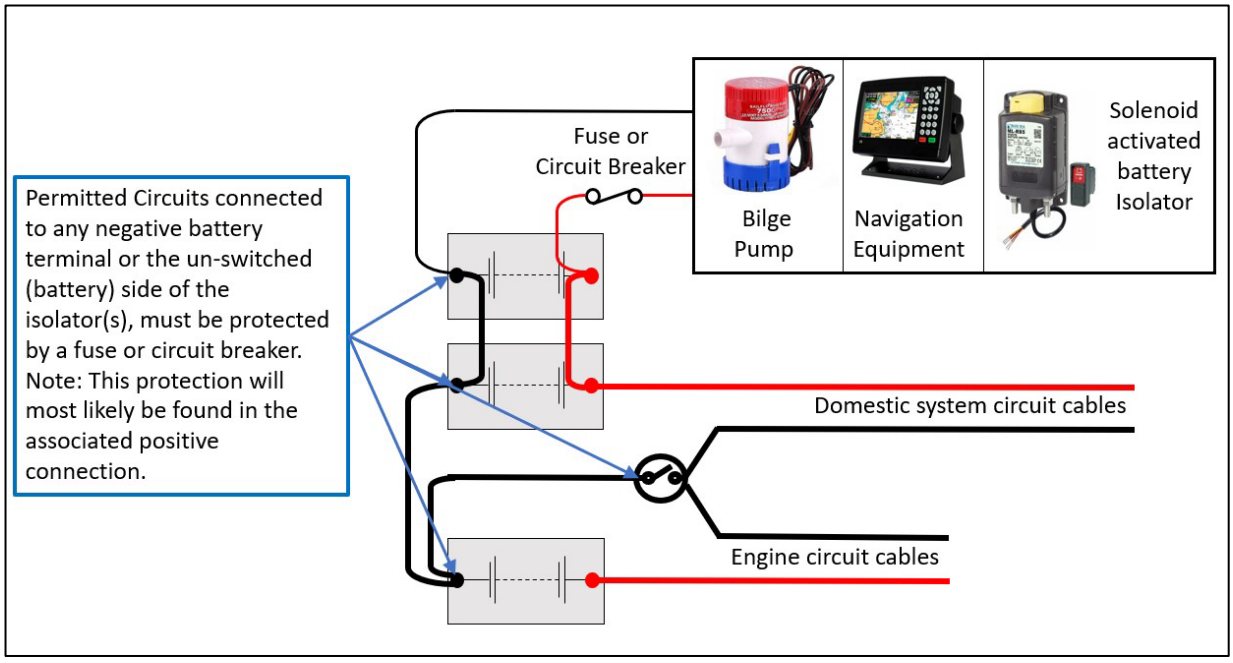


Fig 4. The battery isolator is connected in the negative side.

In addition to looking for load circuit cables connected directly to the negative battery terminals and to the unswitched (battery) side of the isolator, Examiners should look for the positive circuit cable(s) at the battery terminals. This is because it is likely that even on a negative isolated battery installation the fuse or circuit breaker in a load circuit will be in the positive cable.

2 – Additional information to support BSS Examiners' understanding of the BSS Requirements

2.1 General supporting information on the following concepts and fundamental knowledge can be found within the BSS Electrical Core Training Handbook:

- **Rules and Regulations relevant to electricity on boats**
- **Electrical health and safety guidance**
- **Basic of electricity**
- **Battery types, battery capacity and battery bank**
- **Alternating current (AC) power sources on boats**
- **Cables and cable connections** (including insulation and sheathing)
- **Battery isolators** (types of)
- **Circuit protection for DC systems** (types of)
- **Battery charging systems** (types of)
- **Circuit protection of AC systems** (types of)
- **Multiple AC power sources**
- **Reverse polarity on AC systems**
- **Earthing and bonding on AC systems**
- **Galvanic corrosion**
- **Electric and hybrid propulsion systems**

2.2 Battery space ventilation

At Check 3.1.1 all 'unsealed or open-vented' batteries must be stored within a ventilated space, and there must be a ventilation pathway from all battery storage locations to outside of the hull or superstructure. For BSS compliance there is no minimum free air area (in mm^2) but the Guidance for owners at Check 3.1.1 recommends a minimum ventilation area (in mm^2) = number of cells x capacity in Ah x 1.935. The following table provides a ready reckoner as to what this calculation may mean in practice.

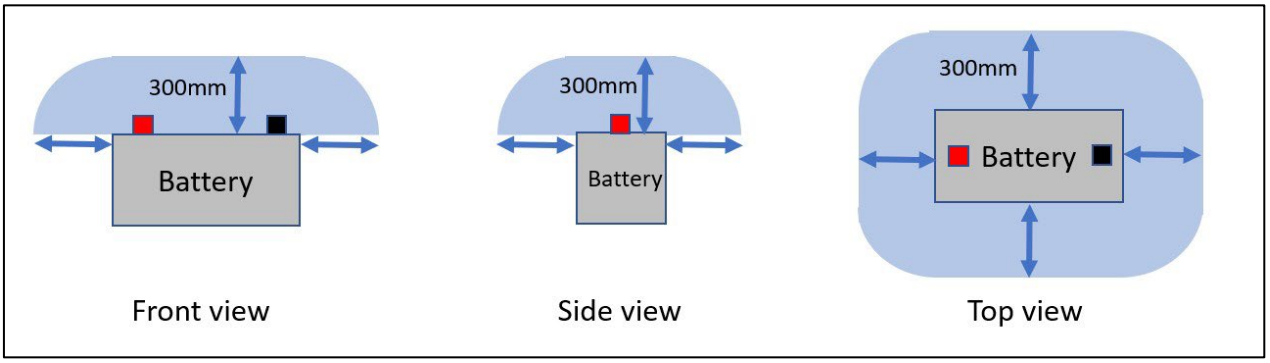
Battery Capacity (Ah)	Number of 2 volt CELLS	Recommended minimum Area (mm^2)	Guide - area equates to the no. of 25mm dia. holes (490mm^2)
6v battery			
105	3	609	2
110	3	639	2
160	3	929	2
12v battery			
63	6	731	2
105	6	1219	3
110	6	1278	3
160	6	1857	4

Venting kits are available for some battery types. This may consist of a tube (or tubes) attached to the battery vent(s) or filler cap(s) and routed to the exterior of the vessel.

NOTE: not to be confused with self "topping-Up" kits available for flooded batteries.

2.3 Separation between battery tops and uninsulated metallic petrol or LPG system components

At Check 3.1.4 metallic petrol or LPG system components within 300mm above battery tops must be insulated (e.g. by the presence of a conduit, shield or enclosure made of insulating material). The following drawing provides added clarity regarding the 300mm separation for metallic components that are not insulated.



Note: The area does not extend below the **top** of the battery.

2.4 Scope of the BSS cable Checks at Sections 3.2 – 3.4

The cable Checks at Sections 3.2 – 3.4 apply to all cables that form part of the boat's DC and AC. permanently installed electrical systems. The Requirements do not apply to:

- Electrical cables (or flexes) attached to portable electrical equipment, such as such as the 230v cable to a microwave oven, even if the equipment is plugged into the boat's electrical system at the time of the Examination.
- Petrol engine spark plug leads (these are covered separately at Check 3.3.3).
- Data and other signal cables (such as CAT 5/6 data cables and co-axial aerial cables).
- Uninsulated 'bonding' straps linking across drive couplings or between anodes.

Electric propulsion systems

Appendix 4 is currently intentionally blank. Supporting information on recognising electric and hybrid propulsion systems can be found in the BSS Core Electrical Knowledge Handbook.

Outboard and portable combustion engines, portable fuel systems and spare fuel

1 – Essential material needed by BSS Examiners to be able to apply certain Part 5 Checks

1.1 Kerosene, Paraffin and Petroil

The BSS Requirements apply to kerosene and paraffin installations in the same way they do for diesel installations. Therefore, during BSS Examinations Examiners must apply the Checks to kerosene or paraffin installations as if they were diesel installations.

The BSS Requirements apply to petroil engines in the same way they do for petrol engines. Therefore, during BSS Examinations Examiners must apply the Checks to petroil engines if they were petrol engines.

Information on the nature of liquid fuels can be found in ECP Appendix 2.

1.2 Portable fuel systems – suitable proprietary manufacture

All portable fuel system components must be of 'suitable proprietary manufacture' (ECP Glossary term). To be of suitable proprietary manufacture components must, on the face of it, have been manufactured for purpose for which they are being used. Components will therefore have been manufactured to recognised standards and will have been performance tested by the manufacturer.

Indicators of suitable proprietary manufacture - portable fuel tanks

- Tanks must be designed to store the fuel in use. Tanks may be marked 'Petrol', 'Gasoline, or 'Diesel', or carry a suitable symbol, but this is not a Requirement provided they are recognisable as being suitable for the fuel in use.
- For BSS compliance portable fuel tanks must have a maximum marked capacity of 30lt. 27lt is the maximum capacity set within the international standard ISO 13591 Small craft – Portable fuel systems for outboard motors. However, the maximum capacity for portable fuel tanks in America and other countries outside of Europe is 30lt, and as many such tanks are used in the UK the BSS adopts the slightly higher 30lt capacity. Restricting the capacity ensures that the corresponding weight is reasonable for one person to carry safely.
- Tanks must be fitted with a carrying handle, configured so that they can be gripped with one hand. This is to help ensure tanks can be carried safely by minimising the risk of them being accidentally dropped.

Indicators of suitable proprietary manufacture – fuel hose assemblies

- To ensure the tank can be disconnected quickly and safely from the remainder of the fuel system and/or the engine, there should be at least one quick-release connector within the system. Such connectors may be at the tank, or further along the fuel supply line (e.g. at the engine connection). Where the quick-release connector is not at the tank a length of hose will often be permanently connected to the tank. Quick-release connectors should incorporate spring-loaded valves in both sections to ensure fuel cannot escape when they are disconnected.
- Hose assemblies should be considered as being of suitable proprietary manufacture unless one or more components are obviously unsuitable. Hoses do not have to be marked. Examples of obviously unsuitable components include:
  - Clear, or translucent hose;
  - Garden-type water hose;
  - quick-release connections that do not automatically seal.
- Portable fuel system components do not have to originate from one manufacturer or supplier. For example, if a hose assembly's priming bulb is damaged it is acceptable to replace the bulb without replacing the hose.

1.3 Portable fuel systems and spare fuel containers – damage or deterioration

'Damage or deterioration' (ECP Glossary term) is that materially affecting, or likely to affect, the integrity, efficiency, or operation of an item or device. The following are indicators of damage or deterioration:

Indicators of damage or deterioration – metal fuel tanks and containers

- Significant surface corrosion (rust) and/or any form of pitting or holes in the metal
- Dents or gouges in the metal
- Missing components, including carrying handles.

Indicators of damage or deterioration - plastic fuel tanks and containers

- Chafing, irregular indentations or punctures
- Signs of corrosion attack (such as softening or environmental stress cracking)

  Softening indicates corrosive attack by the fuel causing the fuel to permeate the plastic or tank gasket material. The physical properties of the material will progressively degrade and may ultimately lead to tank failure or fuel leaks. The presence of softening may indicate that the tank is not being used in accordance with its intended purpose.

  Environmental stress cracking may develop should the tank be subject to tension or bending stress beyond its design tolerance and over prolonged periods. Environmental stress cracks may cause fuel leaks.

  Any form of damage or deterioration on plastic tanks and containers must be considered unsafe, and if identified the tank or container should be removed from the boat.

Indicators of damage or deterioration – hoses assemblies (including priming bulbs)

- Chafing or cuts
- Stress cracking
- Hardening or brittleness
- Significant rust on metal securing clip/clamp arrangements
- Loose clip/clamp arrangements.

2 – Additional information to support BSS Examiners' understanding of the BSS Requirements

2.1 Permanently installed fuel systems suppling outboard engines

It is not uncommon for outboard engines to be supplied with fuel from permanently installed fuel tanks. In such cases the fuel system and outboard engine must be examined against the relevant Checks at ECP Part 2 and Part 5. At Check 2.10.2 and Check 5.1.1 it is recognised that outboard engine fuel hose and its connections located where any spilt fuel would drain overboard (e.g. within an outboard well) may be different to that normally specified for permanently installed hose and connections. The Figures below show the three most likely arrangements for fuel hoses and their connections running across outboard wells where there is a permanently installed tank.

Fig 1. Quick-release connections at the bulkhead and outboard engine

In such arrangements the hose may be an unmarked proprietary portable fuel hose, but could also be to type B1 or B2 of ISO 8469, or to ISO 7840.

A priming bulb may be fitted.

The Checks at Part 5, section 5.2 apply to the hose and both connections.

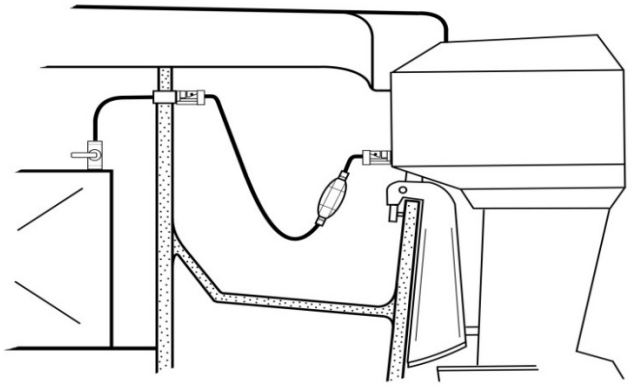


Fig 2. Permanent connection at the bulkhead and quick-release at the outboard engine

In such arrangements the hose may be an unmarked proprietary portable fuel hose, but could also be to type B1 or B2 of ISO 8469, or to ISO 7840.

A priming bulb may be fitted.

The Checks at Part 5, section 5.2 apply to the hose and the outboard connection, and the Checks at Part 2, section 11 apply to the permanent connection at the bulkhead.

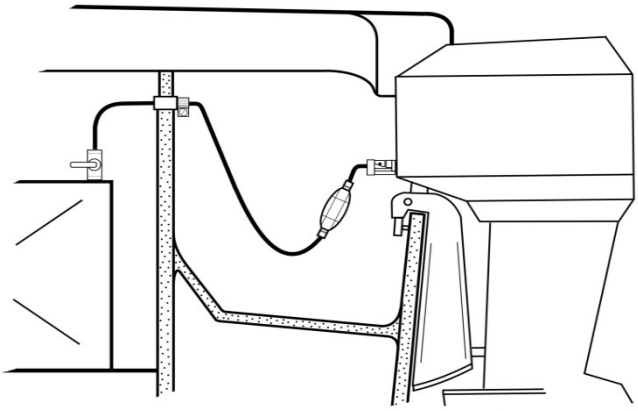
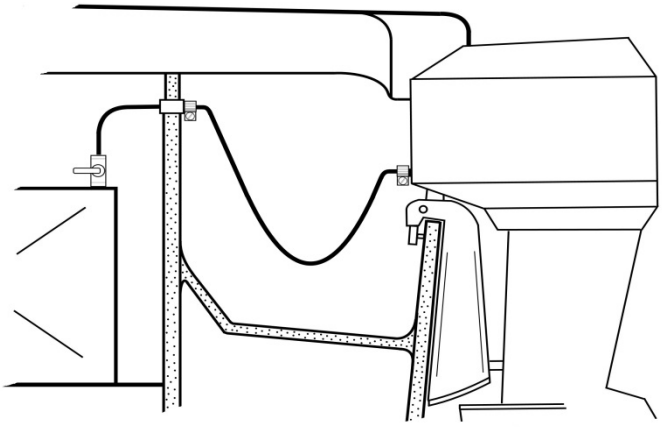


Fig 3. Permanent connections at the bulkhead and outboard engine

In such arrangements the hose may be to type B1 or B2 of ISO 8469, or to ISO 7840.

A priming bulb may be fitted.

The Checks at Part 2, sections 10 and 11 apply to the hose and both connections.



2.2 Portable fuel systems, and spare fuel containers

Portable fuel systems must enable the tank to be disconnected safely from the fuel line and/or the engine without the use of tools, and permit the tank to be conveniently and safely carried ashore for refilling off the boat.

In most cases there will be a single portable fuel tank connected to the engine with a single fuel line. However, it is possible that Examiners will come across portable fuel systems with two portable tanks connected into the fuel line to the engine. In such cases it must be possible to disconnect each tank from the fuel line without the potential for leaking fuel (e.g. through the use of quick-release connectors at the tanks).

Spare portable fuel tanks are any portable fuel tanks not connected to the engine by a fuel line at the time of an Examination.

Spare fuel containers are all such containers that are not portable fuel tanks.

At the time of a BSS Examination, portable petrol tanks and spare petrol containers must be examined against relevant Requirements whether they contain liquid petrol (e.g. if they only contain petrol vapours).

2.3 Portable fuel tanks – securing and labelling

There is no BSS Requirement for portable fuel tanks to be secured (whether in use or spare).

Although not a BSS Requirement providing they can be otherwise recognised as being suitable for the fuel in use, Examiners should encourage boat owners to mark portable fuel tanks with 'Petrol', 'Diesel', etc to ensure the correct fuel is used.

Also, although not a BSS Requirement, Examiners should encourage boat owners to affix a 'Refill ashore' label to all portable fuel tanks.

2.4 The Petroleum (Consolidation) Regulations 2014

The Petroleum (Consolidation) Regulations 2014 regulate the stowage of spare petrol in the UK, including on boats. The Regulations stipulate that the amount of spare petrol carried on a boat is limited to a maximum of 30 litres.

Spare petrol is made up of spare petrol containers and any spare portable petrol tank i.e. one that is not connected to the engine.

The Regulations are intended to mitigate:

a) the risk of storing large quantities of petrol on board; and,

b) the hazard associated with storing and/or decanting fuel from inappropriate containers.

The Regulations apply to all boat owners and it is the responsibility of individual boat owners to ensure compliance. The Health & Safety Executive (HSE) enforce the Regulations and have agreed the BSS approach to petrol stowage as set out at Checks 5.3.1 – 4.

It could be interpreted that BSS have a Requirement at 5.3.3 (2nd bullet-point) that is, on the face of it, in excess of the permitted maximum volume stored by up to 10 litres; but the BSS are clear that it remains the boat owner's responsibility to stay within the legal maximum of 30 litres of spare petrol by not filling the spare containers or tank to capacity. HSE accepts that it is not the role of BSS Examiners to accurately measure the capacity of spare petrol onboard and neither is it the role to of BSS Examiners to enforce Petrol (Consolidation) Regulations.

The approach is intended to allow the potentially critically needed allowance for a spare portable petrol tank, plus up to two small spare petrol containers for use for example with a generator and/or auxiliary outboard, etc. This approach is necessary to address concerns about the increased decanting risk if a spare portable tank could not be accommodated on board.

Prior to the introduction of the 2014 Regulations, acceptable spare petrol containers included those made to the Petroleum-Spirit (Motor Vehicles, etc.) Regulations 1929 and the Petroleum-Spirit (Plastic Containers) Regulations 1982. This legislation was repealed by the 2014 Regulations and now the BSS refers only to the marking requirements for such containers which have remained very similar over time

The type of portable petrol containers is also regulated by the Petroleum (Consolidation) Regulations.

According to the Regulations a portable petrol container must:

a) have a nominal capacity —

i) no greater than 10 litres if made of plastic; and

ii) no greater than 20 litres if made of metal;

b) have a total capacity between 10% and 15% more than the nominal capacity [to allow for expansion of fuel as the temperature increases to the ambient level];

c) be made of either metal or plastic that is suitable and safe for the purpose and will not significantly degrade due to exposure to petrol or naturally occurring ultra-violet radiation;

d) be designed and constructed so that—

i) it is reasonably robust and not liable to break under the normal conditions of use;

ii) the escape of liquid or vapour is prevented;

iii) petrol can be poured safely from it; and

iv) it is not unsteady when placed on a flat surface;

e) be marked or labelled in a legible and indelible form with—

i) the words "PETROL" and "HIGHLY FLAMMABLE";

ii) an appropriate hazard warning sign;

iii) the nominal capacity in litres; and

iv) the manufacturer's name and the date and month of manufacture.

Note that:

a) "nominal capacity" means the maximum volume of liquid that the container is intended to hold at 20°C;

b) "total capacity" means the maximum volume of liquid that the container would hold if filled to the brim.

c) The Regulations include 'type testing' requirements for plastic petrol containers, including

i) Impact test – drop test;

ii) Leakage test – no leakage when subjected to internal pressure;

iii) Strength test – remains intact with internal pressure at up to 1.6bar;

iv) Permeability test –

v) Stress cracking test

d) Examples of suitable warning signs include: -

e) There are no restrictions on the colour for plastic or metal containers, but general custom and practice is that green is used for petrol.

The Petroleum (Consolidation) Regulations specifications above that are grey-highlighted have been adopted as BSS Requirements. The remaining specifications have not been adopted as BSS Requirements, but boat owners should be aware of all the specifications to ensure they are only using petrol tanks and containers that are compliant with the Regulations.

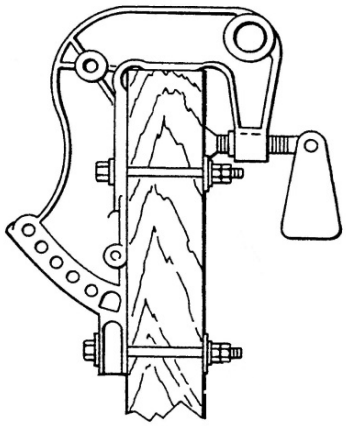
2.5 Outboard engine mounting systems

Outboard engines are usually secured to transoms in one of two ways: quick-release clamps; bolts through the transom. Clamps are usually used on smaller engines with lower h.p. ratings where the engine is removed from the boat for servicing. Bolting tends to be used on larger engines which often remain fixed to the transom for servicing. Some engines may utilize both securing arrangements.

On quick-release arrangements the clamps must be tight. On bolted arrangements the bolts must be tight, and there must be no indications of missing bolts. On both arrangements there must be no signs of damage or deterioration on the mounting bracket or securing arrangements.

Fig 4. shows a mounting bracket with both quick-release clamps, and bolts fitted.

Fig 4. Outboard mounting



Fire extinguishing, escape and carbon monoxide alarms

1 – Essential material needed by BSS Examiners to be able to apply certain ECP Part 6 Checks

1.1 Portable fire extinguishers – essential material - accredited third-party certification marks

To be considered as 'suitable' at Check 6.1.1 portable fire extinguishers must be marked with at least one of the following accredited third-party certification marks –

AFNOR 'NF' mark	**Apragaz Belcert**	**BSI 'Kitemark'**
British Approvals for Fire Equipment	**British Approvals for Fire Equipment**	**Marine Equipment Directive 'ship's wheel'**
Loss Prevention Certification Board	**Loss Prevention Certification Board**	**Société Générale De Surveillance**

A CE mark on a portable fire extinguisher is not an accredited third-party certification mark. The CE mark relates to the European Pressure Equipment Directive (PED). Conformity with the PED does not give any assurance of manufacture or performance testing to a portable fire extinguisher manufacturing standard.

Examiners may accept Firemaster 1000PR B/C [Brass/Chrome] models as being accredited third-party certificated even though they may not carry one of the above marks.

This is because Firemaster have provided the BSS Office with documentary evidence of appropriate certification.

1.2 Emergency escape and carbon monoxide alarms – essential material – understanding the ECP Glossary term 'accommodation space'

To be able to apply the Checking actions at Checks 6.3.1 and 6.4.2 in a robust and consistent manner Examiners must be able to recognise accommodation spaces.

ECP Glossary term - Accommodation space

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

Therefore, each individual space within a boat completely surrounded by permanent boat structure, and where there is provision for sleeping, cooking, eating, washing/toilet, navigation, or steering, is an individual accommodation space.

In the context of accommodation spaces, movable flexible screens/curtains/hoods are not permanent boat structure.

Wheelhouses - wheelhouses completely enclosed by permanent boat structure are accommodation spaces, but wheelhouses with canvas-type screens/curtains, and cockpits with canvas-type hoods are not accommodation spaces as such movable flexible screens/curtains/hoods are not permanent boat structure.

Individual passageways - individual passageways completely surrounded by boat structure are not accommodation spaces unless there is provision for sleeping, cooking, eating, washing/toilet, navigation, or steering within the passageway.

Engine rooms - engine rooms are not accommodation spaces however they are configured (e.g. even walk-through engine rooms are not accommodation spaces in the context of the BSS Requirements).

1.3 Carbon monoxide alarms – essential material – measuring the distance between a carbon monoxide alarm and any door that links accommodation spaces

The second Requirement at Check 6.4.1 specifies that on boats with two or more accommodation spaces a carbon monoxide (CO) alarm must be located within 10m of any door that links the accommodation spaces.

Where there are a number of accommodation spaces (e.g. separate cabins) the sound of an alarm will be deadened by the separating boat structures including closed cabin doors.

By requiring an alarm to be located within 10m of each door that links accommodation spaces there is an assurance that wherever someone is located within the interior of a boat they are likely to be able to hear an activated alarm.

In the context of Check 6.4.1, 'links' means that the door can be used to gain access to another accommodation space, even though the two accommodation spaces may not be immediately adjacent, or directly connected, to each other.

The following two diagrams help explain the distance measurement Requirements for different accommodation space configurations –

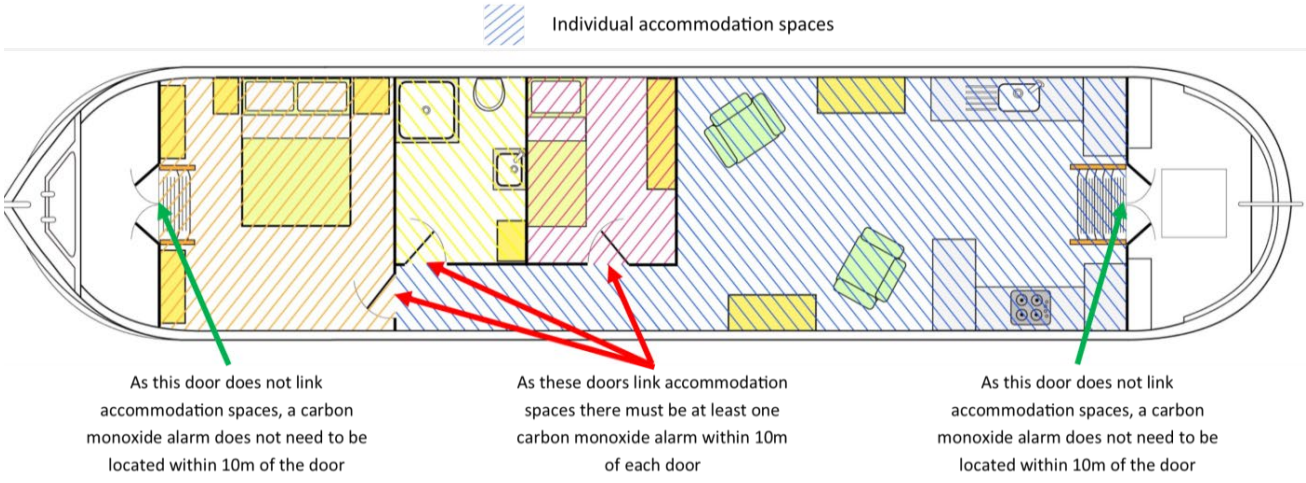


Fig 1. To be compliant at Check 6.4.1 a carbon monoxide alarm must be located within 10m of the three doors that link accommodation spaces.

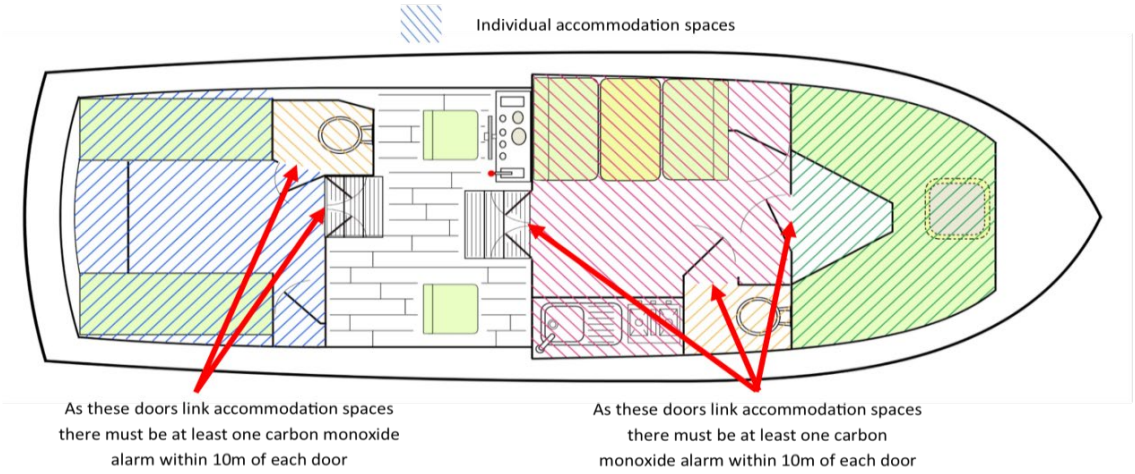


Fig 2. To be compliant at Check 6.4.1 a carbon monoxide alarm must be located within 10m of the five doors that link accommodation spaces. In this example the cockpit/wheelhouse is not an accommodation space, but the two companionway doors do link to other accommodation spaces

1.4 Carbon monoxide alarms – essential material – accredited third-party certification marks

The principles behind the certification of CO alarms are the same as those for portable fire extinguishers.

In the UK the main accredited third-party certification marks likely to be found on CO alarms are those of the British Standards Institute (BSI) and the Loss Prevention Certification Board (LPCB).

However, UL International (UK) Ltd are also recognised as an accredited certification body in respect of the certification of CO alarms to BS EN 50291, and as such their mark may also be found on suitable CO alarms.

Other certification body marks may be acceptable, but Examiners should contact the BSS Office for confirmation of acceptability if other marks are found.

Because the following companies only make CO alarms to BS EN 50291, and because all their alarms are certified by an accredited third-party certification body, Examiners are not required to establish the accredited third-party certification mark on CO alarms made by the following companies:

- BRK
- Dicon
- Ei Electronics
- Fire Angel
- Fire Hawk
- First Alert
- Honeywell
- Kiddie

2 – Additional information to support BSS Examiners' understanding of the BSS Requirements

2.1 Portable fire extinguishers – classification of fires

Class **A** fire = fires involving solid materials, usually of an organic nature, in which combustion normally takes places with the formation of glowing embers (such as paper, wood and similar materials);

Class **B** fire = fires involving liquids (such as petrol, paraffin or alcohol) or liquefiable solids (such as rubber, wax or tallow);

Class **C** fire = fires involving gases (such as propane and butane);

Class **D** fire = fires involving metals;

Class **F** fire = fires involving cooking media (vegetable or animal oils and fats) in cooking appliances.

For protection from a Class C and D fire risk, professional specialist advice is needed.

Fires involving electrical equipment are unclassified, since electricity is a source of heat. Although fires may start due to an electrical fault, they will often spread to involve materials from other classes, such as a timber bulkhead or hull side linings.

2.2 Portable Fire extinguishers – types, and how they work to extinguish fires

Portable fire extinguishers are designed to be carried to a fire and operated by hand.

Fuel, heat and oxygen must be present in order to achieve combustion. When all three factors are present in the correct proportions, combustion will occur.

There are seven main types of extinguishing medium; water, foam, powder, carbon dioxide, wet chemical, clean agent and water mist. Each is suitable for use on different types (or classes) of fire and has various benefits and limitations. The following table contains general guidance as to how the extinguisher mediums work to remove heat and/or oxygen to extinguish a fire.

Since the introduction of the manufacturing standard EN 3, portable fire extinguisher bodies are usually coloured predominantly red, although polished metal types are available. All extinguishers manufactured to EN 3 should carry a coloured zone of 3-10% of the external area to indicate the type of extinguishing medium used. The fire ratings are also usually found marked within the coloured zone or immediately adjacent to it.

Extinguishing medium	Zone colour coding	Class of fire	Extinguishing method
Water	Red	A	Cooling
Foam	Pale cream	A/B	Smothering
Powder	Blue	[A]/B/C and electrical	Knock-down and smothering
CO_2	Black	B/C and electrical	Displaces oxygen
Wet chemical	Canary yellow	A/B/F	Smothering and cooling
Clean agent	Green	A/B	Changed chemical reaction
Water mist	White	A/[B]/F	Cooling and smothering

The BSS requires each portable fire extinguisher to be capable of tackling both Class A and Class B fires (the main classes of fires experienced on small craft) and so the choice is currently limited to foam, powder and a limited number of wet chemical, clean agent and water mist extinguishers.

As carbon dioxide (CO_2) is an asphyxiant and CO_2 extinguishers have freezing capabilities, the use of a CO_2 extinguisher in confined spaces could lead to the personal injury of the user or other occupants. The published BSS guidance is for boat owners to be knowledgeable about safe use and take care when using CO_2 extinguishers in accommodation or other confined space onboard.

Halon extinguishers are the subject of an international ban, are illegal to have on board and are not to be considered as part of the specified number of portable fire extinguishers. Current advice is for owners to contact local recycling centres or specialist waste disposal companies to arrange for an environmentally-friendly disposal.

2.3 Portable fire extinguishers - fire ratings

The fire rating of an extinguisher appears as a series of numbers and letters e.g. 5A/34B. The letters indicate the class of fire, and the numbers relate to the ability of the extinguisher to successfully put out a fire under test conditions. The bigger the numbers, the bigger the fire on which the extinguisher has been tested.

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It is important to appreciate that 5A/34B is the minimum accepted fire rating and that this is a small extinguisher for small fires. For example, a 5A/34B dry powder unit once deployed is likely only to last around ten seconds. The sizing is commensurate with the purpose of the BSS portable fire extinguisher Requirements, namely, to provide boat owners with the means to knock-down a small fire before it escalates, or to knock-back a fire enough to enable boat occupants to escape past it.

At Check 6.1.1 the minimum number of portable fire extinguishers may be reduced by a maximum of one 5A/34B rated extinguisher where the vessel has either no internal combustion engines, or no fuel-burning appliances. This is because internal combustion engines and fuel burning appliances are a major cause of boat fires, so if one or both of these causes of fire are not present the overall risk of a fire starting is reduced.

2.4 Portable fire extinguishers - manufacturing standards

BS EN 3, Portable fire extinguishers, covers the manufacturing of portable fire extinguishers from 1kg to 12kg and 2-litres to 9-litres capacity. The standard is of more relevance to extinguisher manufacturers than the end user, but it specifies in detail the extinguisher characteristics, duration of operation, any residual charge, and the performance testing of portable fire extinguishers.

BS 5423, Specification for portable fire extinguishers, was the previous portable fire extinguisher manufacturing standard, but it was superseded by BS EN 3 and withdrawn in 1997.

2.5 Portable fire extinguishers - accredited third-party certification marks

The BSS does not require portable fire extinguishers to have been manufactured to a particular standard (e.g. BS EN 3), but it does require such extinguishers to carry at least one accredited third-party certification mark.

Accredited third-party certification, sometimes known as 'type approval' schemes ensure a high level of confidence in the manufacturer's claims of adherence to manufacturing and performance standards and consistent product quality. In practice this works by accreditation bodies taking account of the performance testing reports of accredited laboratories and overseeing the manufacturing process to ensure that extinguishers are consistently manufactured to the correct standard. Extinguisher manufacturers are then licenced to display the accreditation body's mark on their extinguishers. Accredited third-party certification is employed extensively in safety critical applications.

The accreditation third-party certification bodies whose marks are shown at Appendix Section 1 are themselves accredited by the relevant national accreditation body to attest the manufacture and performance testing of portable fire extinguishers to EN3.

2.6 Portable fire extinguishers - servicing

The BSS does not require portable fire extinguishers to be serviced. However, boat owners are recommended to have portable fire extinguishers serviced in accordance with the servicing standard BS 5306 where this standard is printed on the body of the extinguisher. When an extinguisher has been serviced in accordance with BS 5306 the service technician will affix a service label to the extinguisher body which should include all the following information:

- full postal address of the servicing company:
- date of service;
- type of service – basic, extended or overhaul;
- engineer's ID;
- date of last discharge; and,
- weight.

Fig 3. Example service label

BAFE registered service technicians are recommended - British Approvals for Fire Equipment (BAFE) is a not-for-profit organisation which promotes quality within the fire protection industry, including administering the Registered Fire Extinguisher Service Technicians Scheme.

However, 'service-free' or 'maintenance-free' portable fire extinguishers are becoming more popular. Extinguishers of this type may not be marked 'service-free' or 'maintenance-free', but they may be distinguishable by there being no reference to BS 5306 printed on them. For extinguishers of this type it is for the boat owner to inspect them regularly for operational serviceability as specified by the manufacturer. If boat owners are in doubt as to whether a portable fire extinguisher is 'service-free' or 'maintenance-free' they are recommended to contact the manufacturer for further information.

2.7 Portable fire extinguishers – obsolete or excessive numbers of extinguishers

Portable fire extinguishers in greater numbers than required at Check 6.1.1 may be found on board. This is acceptable as the BSS Requirements are minimum safety, rather than absolute, specifications.

The published BSS guidance for boat owners is that where portable extinguishers are kept on board in additional numbers to the minimum BSS Requirements, these will not be subject to Checks 6.1.1 –

6.1.3. Published BSS guidance is for boat owners to remove from the boat any additional portable fire extinguishers not marked with an accredited third-party certification mark and not in good condition, as these may not work or work effectively and safely if called upon. Alternatively, owners are recommended to replace such units with compliant extinguishers.

Current advice is for owners to contact local recycling centres or specialist waste disposal companies to dispose of unwanted portable fire extinguishers.

2.8 Fixed fire extinguishing systems

The BSS Requirements do not include minimum specifications for fixed fire extinguishing systems such as those installed in engine spaces. There are a number of reasons for this, including that fixed systems cannot be certified by accredited third-party certification bodies, and that ensuring fixed systems are appropriate for the engine/s and engine space is relatively complicated.

Instead, the approach taken is to promote that engine space fuel and electrical components meet BSS Requirements so as to help minimise the chance of an engine space fire, and also that fire-resistant fuel components mitigate the risk in the event of a fire and allow added time for craft occupants to escape.

The BSS website does include an encouragement for boats owners to consider having fixed automatic fire extinguishing systems in engine spaces. Because such products cannot be certified by an accredited certification body, assurances may be gained by choosing items approved by a relevant marine body such as the Maritime and Coastguard Agency. Competent installers should be used to help select the right size and type of a fire extinguishing system for the engine space and advice regarding any required onward service costs.

2.9 Fire blankets

BS EN 1869, Fire blankets, covers the manufacturing of fire blankets. **BS 6575, Specification for fire blankets**, was the previous fire blanket manufacturing standard, but it was superseded by BS EN 1869 and withdrawn in 1999.

To be of the correct specification at Check 6.2.1 fire blankets only have to be marked 'BS EN 1869' or 'BS 6575'. Fire blankets do not have to carry an accredited third-party certification mark. Note however, that fire blankets manufactured outside of the UK may not be marked 'BS EN 1869' and may just be marked 'EN 1869' or 'xx EN 1869'.

The published BSS guidance for boat owners is to replace a fire blanket after use as even the slightest imperfection can result in the blanket being completely ineffective. A fire blanket which doesn't work may actually help to spread a fire quicker, and it could instead escalate in severity.

Fire Industry Association (FIA) advice is to replace fire blankets if there is wear, contamination or damage to the fire blanket material or damage to the fire blanket hand hold devices or serious damage to the container. FIA advice is to follow any replacement date instructions, or if there are none then if more than seven years from date of commissioning consider replacing the blanket.

2.10 Emergency escape

Requiring each accommodation space to have two means of escape means that, wherever they are located, occupants should be able to turn their back on the threat, whether it is a fire, or water caused by sinking or being hung up in a lock, and make a safe exit.

Means of escape may be main doors, proprietary hatches, opening windows or fixed windows provided with a means of breaking out.

The published BSS guidance for boat owners is not to lock exits from the outside, and not to block them with **boat equipment or personal** possessions, etc., and owners are recommended always to have two means of escape available to them in order to be able to turn their back on the threat.

As shown at Fig 4, individual cabins with one door opening into a fore-aft passageway need not have a second means of escape so long as the passageway allows escape at each end.

Fig 4. Compliant means of escape from individual cabins

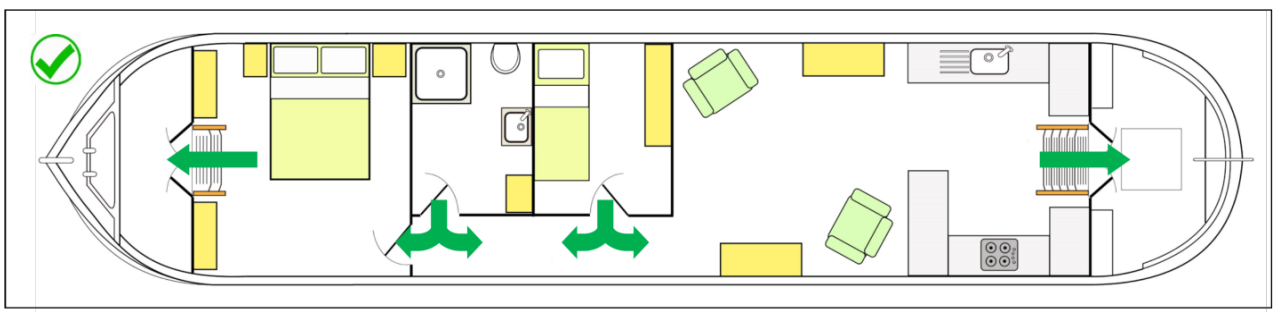


Fig 5. – Compliant means of escape from individual cabins on a narrowboat

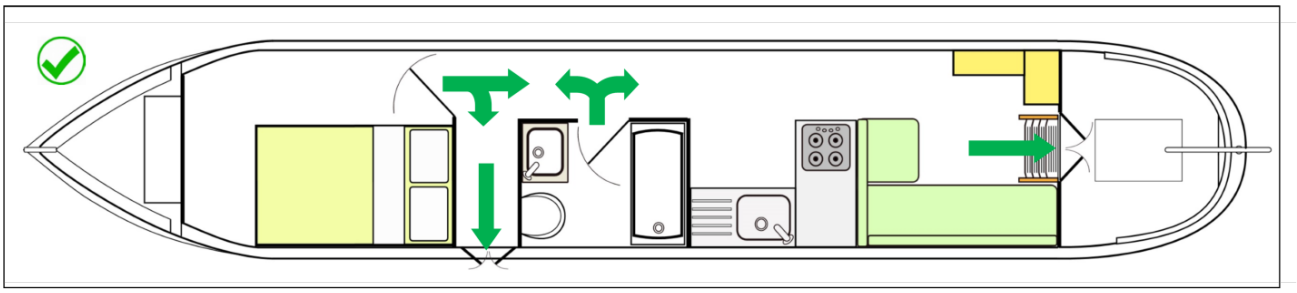


Fig 5 shows an individual cabin at the forward end of the accommodation space with compliant means of escape, but the same approach applies where there is an individual cabin aft with a solid bulkhead to the engine space. This arrangement is compliant because a person exiting the cabin can choose to go aft or turn immediately to port and exit through the side hatch.

In such cases, where a side hatch provides one of the two means of escape, published BSS guidance for boat owners is that the escape route may not be effective in certain emergency situations. For example, in a narrow lock it may not be possible to open side hatch doors.

Also, in the event of a narrowboat being hung-up in a lock, using a side hatch as a means of escape may itself place the occupants in further danger.

2.11 Carbon monoxide poisoning – reference material

The CoGDEM/BSS awareness leaflet 'Carbon Monoxide Safety on Boats' should be considered as authoritative and as containing crucial underpinning knowledge for boat owners.

Additional safety information and guidance is available on the BSS website at www.boatsafetyscheme.org/co

2.12 Carbon monoxide – the BSS Requirements

The Requirement at Check 6.4.1 that all boats having one or more accommodation space(s) must be provided with at least one carbon monoxide (CO) alarm addresses the risk presented by carbon monoxide entering from sources outside the boat. CO entering from outside a boat can quickly build up to dangerous levels as the enclosed nature of accommodation spaces means that it may not be easily dissipated or vented.

The Check at 6.4.2 (Advisory for privately owned and managed boats) addresses the risk presented by CO emissions from solid fuel stoves. Solid fuel stoves present a specific CO risk as during normal operation they can produce 100 times more CO than LPG hob burners that are faulty. In addition, solid fuel stoves are known to be a particular threat at night when occupants are asleep (when there are relatively fewer air changes within the boat, and when a fire within a solid fuel stove is dying down). A CO alarm in the same space as the stove provides protection to craft occupants should flue gases escape from the stove into the space.

2.13 Carbon monoxide alarms - manufacturing standards

Until 2010 BS EN 50291 was a single standard, but in 2010 it was divided into two parts (BS EN 50291-1 and BS EN 50291-2).

The Requirement at Check 6.4.3 is simply that carbon monoxide (CO) alarms must be certified to BS EN 50291, and therefore compliant CO alarms may have been certified to BS EN 50291, BS EN 50291-1, or BS EN 50291-2. However, as the life expectancy of a CO alarm is usually 7-10 years it is unlikely that Examiners will come across many CO alarms manufactured to the original BS EN 50291.

Although the BSS accepts CO alarms certified to BS EN 50291, BS EN 50291-1, or BS EN 50291-2, alarms to BS EN 50291-2 are best suited for boats. The '-2' edition of the BS EN means that the units will have been tested to meet additional performance standards specifically relevant to boat installation - namely, shock, static orientation, dynamic orientation, and steady-state acceleration.

Therefore, although not a BSS Requirement, at the point of selection boat owners are recommended to choose '-2' units. The BSS website has a list of '-2' alarms recommended by the makers as suitable for use in boats www.boatsafetyscheme.org/co

CO alarms manufactured outside of the UK may not be marked 'BS EN 50291' and may just be marked 'EN 50291'' or 'xx EN 50291''

The Requirement at Check 6.4.3 states that accredited third-party certification can be to BS EN 50291 or equivalent. At this time the BSS is not aware of an equivalent standard to BS EN 50291 and so any claims of equivalence should be reported to the BSS Office.

Dual alarms (for example smoke/CO alarms) can be accepted provided the CO alarm aspect has accredited third-party certification to BS EN 50291.

2.14 Carbon monoxide alarms – unsuitable, or excessive numbers

The BSS recommends that only CO alarms deemed a suitable type at Check 6.4.3 should be trusted to provide protection from CO poisoning. Any unsuitable CO alarms should be removed or replaced by the owner from the boat because they may not work, or work effectively and safely, if called upon.

CO alarms in greater numbers than required at Check 6.4.1 and/or 6.4.2 may be found on board. This is acceptable as the BSS Requirements are minimum safety, rather than absolute, specifications. The published BSS guidance for boat owners is that where CO alarms are kept on board in additional numbers to the minimum BSS Requirements these will not be subject to Checks 6.4.3 or 6.4.4.

2.15 Carbon monoxide alarms – location and placement

The BSS Requirements (at Checks 6.4.1 to 6.4.4) do not address the location or placement of CO alarms, other than the Requirement at Check 6.4.3 that alarms found to be necessary at Checks 6.4.1 and/or 6.4.2 must be in open view.

Guidance for boat owners regarding the location and placement of CO alarms to provide best protection can be found with the alarm manufacturers' installation instructions. However, if these instructions are difficult to meet on the boat, then best practice pointers are published in the CoGDEM/BSS awareness leaflet 'Carbon Monoxide Safety on Boats', and on the BSS website at www.boatsafetyscheme.org/co

2.16 Carbon monoxide alarms – can detect hydrogen gas

The published BSS guidance for boat owners is that CO alarms can activate when batteries gas off, especially if the boat's batteries are being over-charged. The chemical sensors in CO alarms react to hydrogen typically at around 5% of the Lower Explosive Limit.

Therefore, there is a concern that if the concentration of diluted hydrogen has reached this level at the remote location of the CO alarm, then the hydrogen concentration closer to the source of the emission is likely to be much higher, and could be approaching an explosive concentration, especially in the battery compartment itself.

Hydrogen readily forms an explosive mixture with air and the ignition energy required to ignite a flammable hydrogen/air mix is very low. Even very small sparks, such as those produced by wearing certain types of clothing, are capable of igniting hydrogen/air mixtures and causing an explosion.

Accordingly, published BSS guidance for boat owners is that should battery charging produce enough hydrogen to activate a CO alarm, it is a call to action not to be ignored by the boat owner. If any boater is confident that a CO alarm activation was not caused by the presence of CO, they should stop the battery charging, not allow any source of ignition to be operated, and should investigate any battery charging issue having first immediately opened windows, doors and awnings to disperse any hydrogen – noting that the flammable gas rises rapidly.

Liquefied Petroleum Gas (LPG) systems

1 – Essential material needed by BSS Examiners to be able to apply certain Part 7 Checks

1.1 Cockpits

For the purposes of the BSS Checks, the term 'cockpit' should be considered to include any recessed area that is lower than the surrounding decks, such as well decks on narrowboats and aft cockpits on river cruisers.

1.2 'Self-draining' cockpits

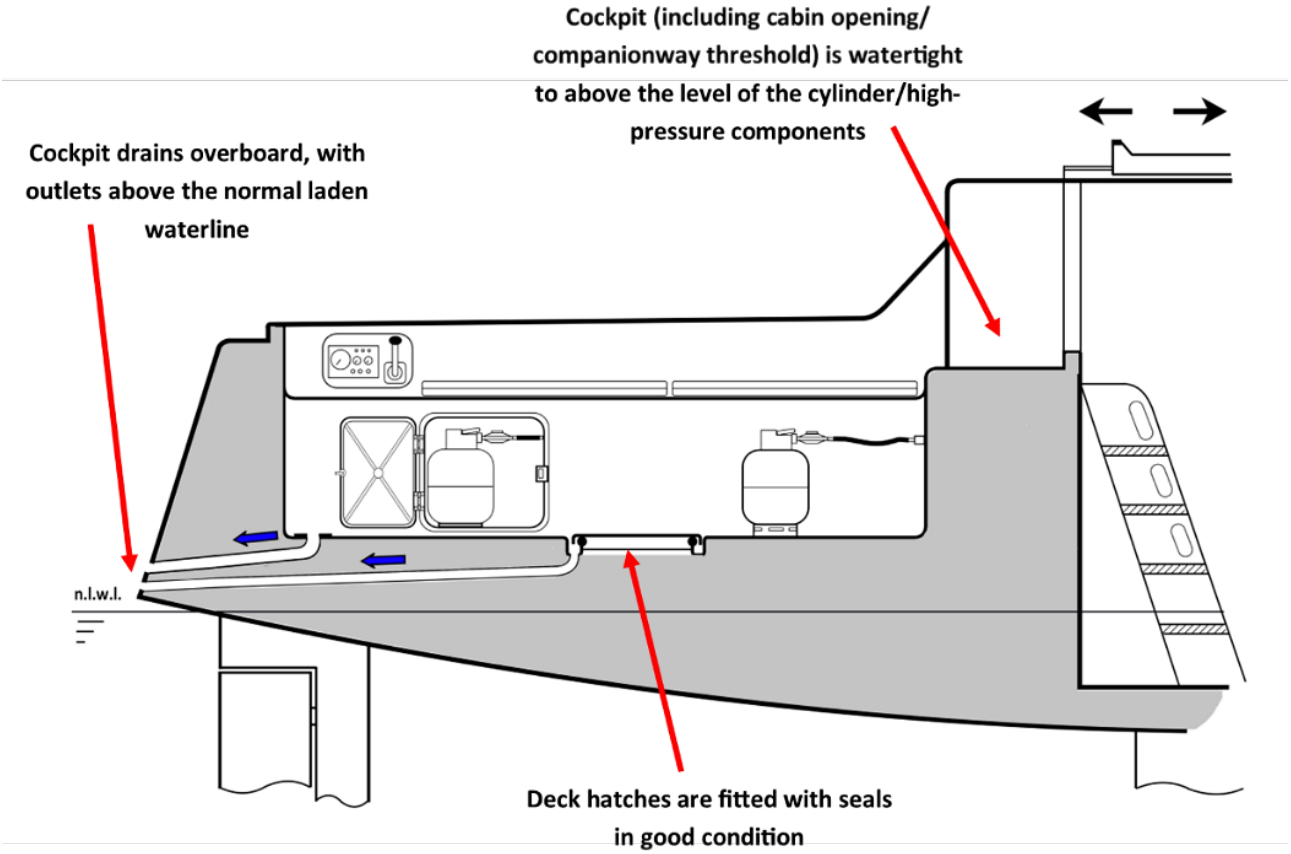
Checks 7.1.1, 7.2.3, 7.2.4 and 7.2.5 refer to 'self-draining' cockpits.

Only a qualifying self-draining cockpit can be considered to be in an 'open location'

When determining compliance at these Checks, a cockpit may be accepted as being 'self-draining' if:

- it drains overboard; **and,**
- the drain outlets are above the normal laden waterline; **and,**
- the cockpit is watertight to the interior of the vessel at least to a height equal to that of the height of the top of the cylinder valves and other high-pressure components where these are located higher; **and,**
- deck hatches or similar openings below the height of the cylinder valves and other high-pressure components where these are located higher must be fitted with a seal or gasket, and the hatch or opening structures, and the seal or gasket, must be complete and free of signs of damage or deterioration.

Well decks and other recessed deck areas may be accepted as being 'self-draining' cockpits at Checks 7.1.1, 7.2.3, 7.2.4 and 7.2.5 if they conform to the above specifications, a 'self-draining' cockpit is illustrated below.



Although no cylinders are present, this photograph adds clarity to how in a 'self-draining' cockpit a threshold/bridge deck is normally present between the cockpit and the cabin opening/companionway to make the cockpit watertight to the interior of the vessel to at least the height of the cylinder valves and other high-pressure components. In this yacht, a cylinder could be stowed in an open location within the cockpit well, or within a housing within the cockpit well, provided the cylinder valve/high-pressure components were lower than the bridge deck into the cabin.

To be accepted as 'self-draining' the visible proprietary deck hatch would need to be fitted with a complete seal around the opening (and be in good condition), and the cockpit would need to drain overboard with the outlets above the normal laden waterline.

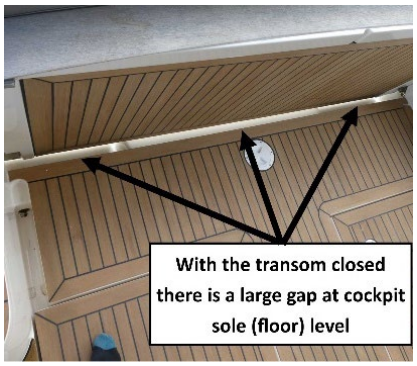
1.3 'Open transom' cockpits

Check 7.2.4 refers to 'open transom' cockpits.

'Open transom' cockpits are those where, by design and construction, the transom is open or cut away enough to allow pedestrian access on/off the boat. When determining compliance at Check 7.2.3, a cockpit may be accepted as having an 'open transom' if:

- enough of the transom is open/cut away that normal pedestrian access is possible through the transom; **and,**
- the cockpit sole is free-draining overboard through the opening in the transom (there must be no lip or other form of threshold across the opening that would inhibit the free flow of escaping LPG overboard); **and**,
- in cases where there is a gate or door across the opening, or the transom itself can be hinged to form an open transom, when the gate, door or transom is closed the cockpit sole must still be free draining through the transom opening.

Examples of 'open-transom' cockpits are shown below



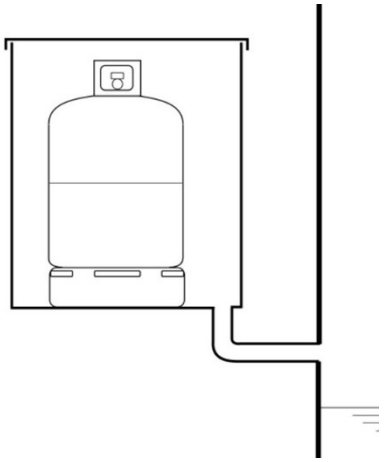
LPG cylinder lockers and housings

Lockers and housings are both intended to offer protection to cylinders, but they have different characteristics.

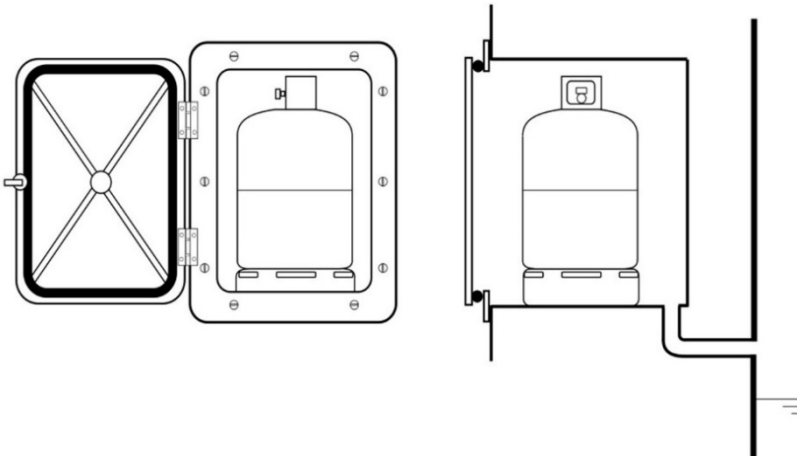
Lockers are enclosures that:

- are vapour-tight up to the level of the top of the cylinder valves, or other high-pressure components where these are higher; and,
- are fitted with a drain to the outside; and,
- must not open into engine and battery spaces

Lockers are often top-opening but may be side opening if the locker is on the exterior of the vessel where any escaping LPG vapour (around the door opening) would flow overboard unimpeded.



Top-opening locker



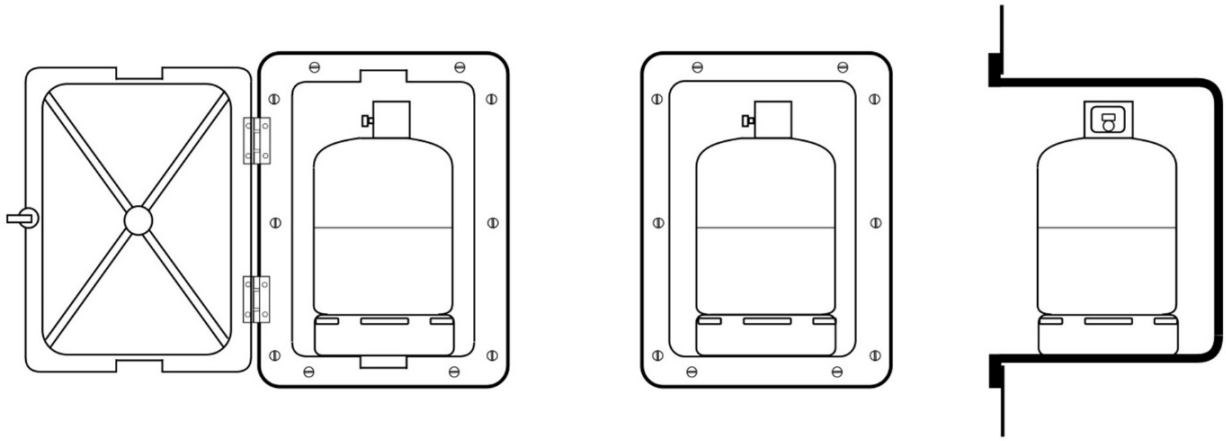
Side-opening locker with continuous seal around the door

Housings are enclosures that provide full or partial protection to cylinders that are in an 'open location'.

The term 'open location' means that the cylinder is in a location on the exterior of the vessel where any escaping LPG vapour would flow overboard unimpeded. Therefore, where housings form an integral part of boat structure they must be sealed to the interior of the vessel.

There are no specifications for the extent that a housing must enclose a cylinder(s), so housings may just partially enclose the cylinder, or they may fully enclose the cylinder and include one or more doors.

Housings are not provided with overboard drains, but if they are fitted with a door(s) then the housing must be permanently ventilated to the exterior of the vessel in some way. The BSS Requirements do not specify the ventilation type, or the minimum free air area, but it is normal to see ventilation provided by way proprietary gaps through the doors or within the housing structure, or simply loose fittings doors.



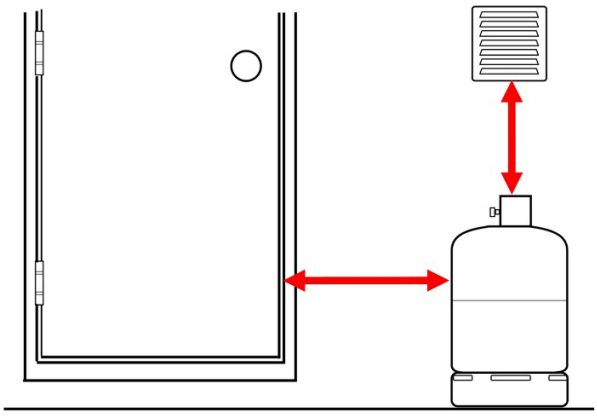
Housings do not have to be fitted with a door, but where they are the housing must be ventilated to the outside.

Continues/

1.5 Measuring between cylinders, housings and openings into the interior of the vessel and ignition sources

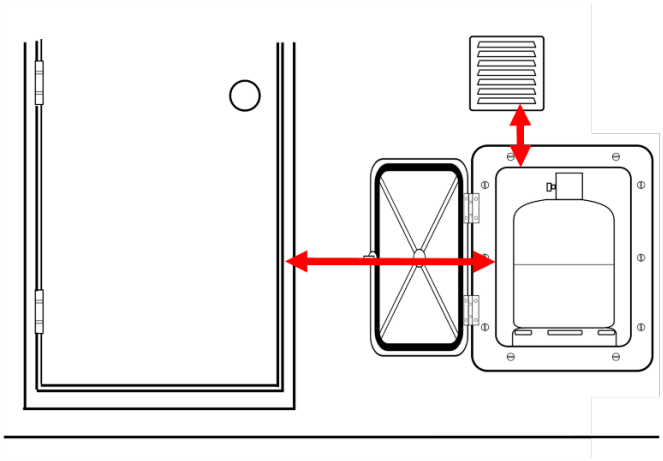
At Check 7.1.1 cylinders in 'open locations' must not be located within 0.5m of openings into the interior of the vessel or any source of ignition.

As shown by the following drawing, the distance to measure is the shortest between the cylinder and any opening into the interior of the vessel (or the source of ignition).



Check 7.2.4R says 'Side-opening lockers with door openings within 0.5m of an opening into the interior of the vessel, or any source of ignition, must be fitted with a continuous seal around the whole door.'

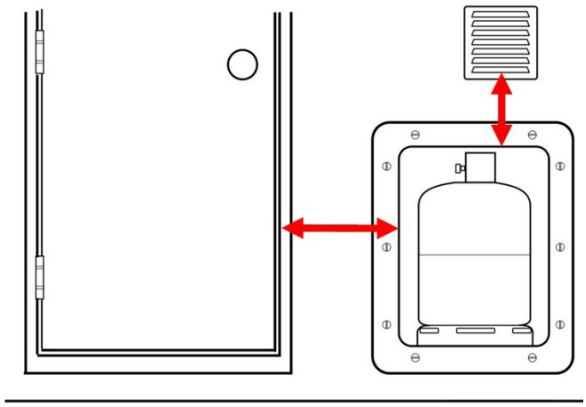
As shown by the accompanying drawing, the distance to measure is the shortest between the locker opening and any opening into the interior of the vessel (or the source of ignition).

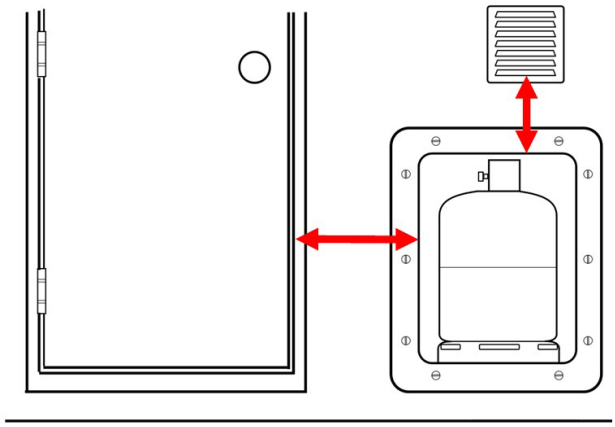


At Check 7.2.5 cylinder housing openings must not be located within 0.5m of openings into the interior of the vessel or any source of ignition.

As shown by the accompanying drawings:

1. where the housing has no door the distance to measure is the shortest between the housing opening and any opening into the interior of the vessel (or the source of ignition); or,
2. where the housing has a door the distance to measure is the shortest distance between the housing's ventilation provision and any opening into he interior of the vessel (or source of ignition).





2 – Additional information to support BSS Examiners' understanding of the BSS Requirements

2.1 Supporting information to be found in the BSS LPG Training Manual

Supporting information on the following can be found within the BSS LPG Training Manual:

Non-return valves	• The different types of non-return valves fitted within cylinder connections. (Check 7.7.2)
Hose connections	• Pre-made hose assembly connections for high-pressure hoses. (Check 7.7.3)
	• Suitable nozzles secured by crimped or worm drive clamps for low-pressure hose connections. (Check 7.9.5)
	• Suitable connections for BS 669 and EN 14800 hose assemblies. (Check 7.9.1)
	• Portable appliance hoses connected with bayonet, plug and screwed fittings (Check 7.10.2)
Regulators	• How to recognise manually adjustable regulators. (Check 7.7.6)
Pipework and connections	• Suitable pipe material. (Check 7.8.1)
	• Suitable pipe joints. (Check 7.8.3)
	• Proprietary 'tools to remove' end-stops for pipe spurs. (Check 7.8.5)
	• Proprietary 'tools to remove' cap or plug for screwed portable appliance connections (Check 7.10.3)
Isolation valves	• Suitable isolation valves. (Check 7.11.2)
Test points	• Proprietary test points on appliances. (Check 7.12.1)
	• Proprietary test points fitted in pipework. (Check 7.12.1)

2.2 Cylinders lockers or housings of suitable proprietary manufacture

Check 7.4.5 requires cylinder lockers and housings to be of 'suitable proprietary manufacture'.

Most cylinder lockers and housings will very obviously be manufactured for the purpose because they will be integral to the structure of the boat but some will be proprietary after-market products.

Examples of after-market cylinder lockers being of suitable proprietary manufacture are provided below. Common features include a drain facility and pipework exit points. Note that the yacht style lockers will likely be made of high-density polyethylene.

Yacht cylinder locker

Cruiser cylinder locker

Yacht cylinder locker

Side opening cylinder locker

Where the locker or housing is not obviously of suitable proprietary manufacture, Examiners should apply the material thickness Requirements at Check 7.4.5.

2.3 Portable appliances

Self-contained portable appliances

Self-contained portable appliances are those where the cylinder or cartridge is located within the appliance, or where the appliance and cylinder are part of a portable package, such as with camping gas stoves and space heaters.




Published BSS guidance is that self-contained portable appliances should never be used on board boats as during use there is a risk of fire and/or explosion. However, it is recognised that some boat owners may choose to store such items on board so that on an occasional basis they can be used ashore. When on board, the cylinders or cartridges for self-contained portable appliances must be stored in accordance with Check 7.1.1. Owners may choose to store the whole appliance (with cylinder or cartridge attached) in accordance with Check 7.1.1, or store the disconnected cylinder or cartridge in accordance with Check 7.1.1.

Portable appliances attached to connection points

Section 7.10 addresses portable appliance connection points.

Portable appliance connection points are relatively rare on boats and are generally associated with FRP yachts with BBQ appliances that can hang over the water from push-pit or pulpit rails.

The connection could potentially be used to supply a gas-powered portable generator/invertor or even blowlamp engine-start supply on a vintage 1910/20s narrowboat.

An LPG BBQ over the stern of a yacht

A vintage narrowboat blowlamp engine-start

A LPG-powered portable generator/invertor

It follows that Examiners will need to be vigilant in identifying any portable appliance connection points by following each LPG line spur.

2.4 Sealing arrangements for pipework exiting cylinder lockers and housings

There are three compliant types of sealing arrangements from cylinder lockers: bulkhead fittings; cable glands; and sealant.

i) bulkhead fitting - A bulkhead fitting is compression fitting allowing connection of LPG pipe or hose to another LPG pipe, through the cylinder locker bulkhead.

Many builders supply new boats with the bulkhead fitting drilled through as this can allow a length of jointless pipe from inside the gas locker to beside the appliance or 'tee' joint. The olives can be still used and provide an effective seal.

Whether the fitting is drilled or not usually cannot be identified by visual assessment and both types are compliant.

ii) cable gland - Cable glands are designed to attach and secure the end of electric cables to provide strain relief and to seal cables which pass through bulkheads.

They serve a similar purpose providing an effective seal for continuous lengths of LPG pipe passing through a cylinder locker

iii) use of sealant - In other possible applications, like the LPG tightness of cylinder locker seams, the use sealant is not permitted.

The use of sealant is permitted to seal an LPG pipe leaving an LPG locker.

Sealant can be used to seal the LPG pipe through the cylinder locker bulkhead or to seal an LPG pipe within a conduit. The image shows sealant used in both applications

2.5 Cylinder locker drains

Check 7.3.1

At Check 7.3.1 the Requirement is that cylinder locker drain outlets must be located above the normal laden waterline (n.l.w.l.). However, the Applicability permits there to be an opening(s) below the n.l.w.l. provided the opening(s) above the waterline comply with the Requirement at Check 7.3.6. The following drawings provide added clarity to the Requirement and Applicability at Check 7.3.1.

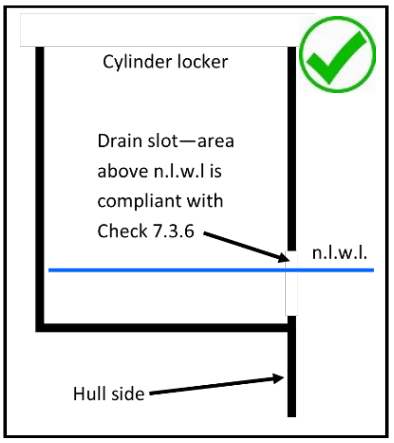


Fig 1a. The drain outlet will be compliant at Check 7.3.1 provided the area of the opening above the n.l.w.l is compliant at Check 7.3.6.

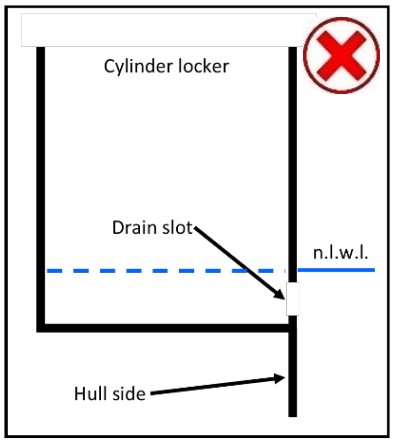


Fig 1b. The drain outlet is not compliant at Check 7.3.1 as it is not above the n.l.w.l.

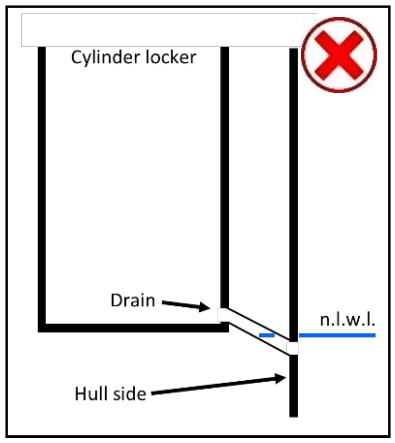
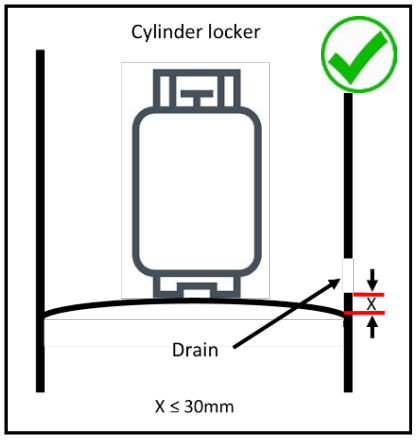


Fig 1c. The drain outlet is not compliant at Check 7.3.1 as it is not above the n.l.w.l.

Although the arrangement at Fig 1 would be compliant with the BSS Requirements, published BSS guidance is that on boats where river/canal water can enter a cylinder locker through a locker drain the owners are advised to regularly assess the condition of the locker to ensure water cannot enter the interior of the vessel. Particularly on lockers made from mild steel the ongoing presence of water in the locker could lead to corrosion, which in turn could lead to river/canal water flooding into the interior of the boat. Owners are therefore also advised to consider changing the cylinder locker arrangement to prevent river/canal water entering the drain and/or locker.

Check 7.3.2 – Requirement

The Requirement at Check 7.3.2 is that cylinder locker drain openings must be located not greater than 30mm above the lowest point of the locker. The following drawings provide added clarity.



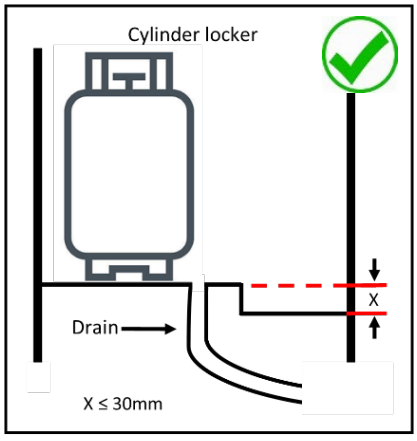


Fig 2a. In both these scenarios, height X (lowest point of the locker to the drain opening) is less than or equal to 30mm and therefore meets the Requirement at Check 7.3.2.

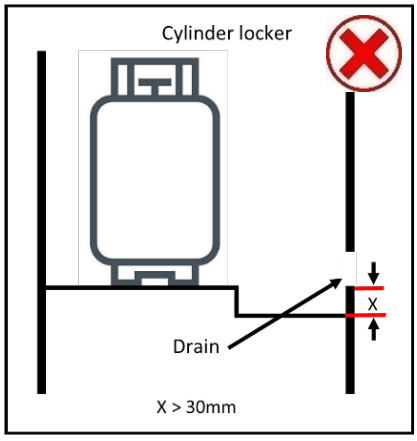
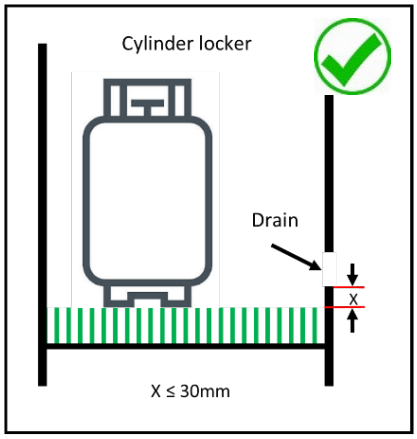


Fig 2b. Here, height X (lowest point of the locker to the drain opening) is greater than 30mm and therefore does not meet the Requirement at Check 7.3.2.

Check 7.3.2 – Applicability

The Applicability at Check 7.3.2 permits an alternative compliance option in cases where drain openings are greater than 30mm above the lowest point of the locker. Such lockers may be accepted as being compliant where the space below the drain opening is filled with a suitable material. The following drawings provide added clarity.



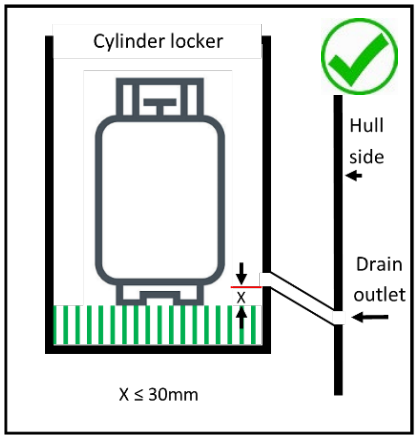


Fig 3a. In both these scenarios, to make the installation compliant at Check 7.3.2 the area beneath the cylinder has been filled to ensure that height X (lowest point of the locker to the bottom of the drain opening) is no greater than 30mm.

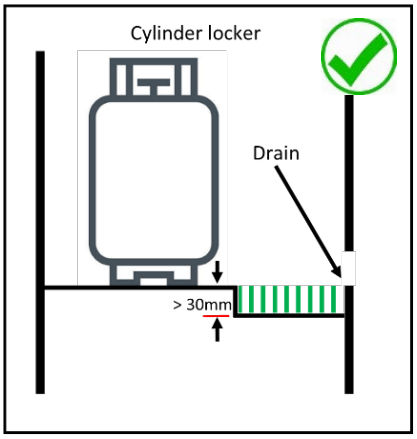


Fig 2b. In this scenario, a recess in the base of the locker has been filled to ensure the bottom of the drain opening is no greater than 30mm above the lowest part of the locker.

The material used the fill the space beneath the cylinder(s) does not have to be permanently installed, but it must be robust enough that it can support the cylinder(s) in an upright position.

The material used must also be solid enough the any escaped LPG vapour cannot be absorbed (leading to a potentially explosive mix).

The material does not have to completely fill the space, but any gaps or voids should be kept to a minimum. For example, sheets of plywood could be laid in the bottom of a locker to raise the base. The plywood would not have to be laminated in, but any gaps around the outer edges must be kept to a minimum (and ideally any gaps should be filled, for example with a suitable sealant).

Concrete could also be used to completely fill the space beneath cylinder(s), but boat owners are guided to be careful about the compatibility of the material being used to fill the space and the material of the locker.

If considering filling the space beneath cylinders to achieve compliance at Check 7.3.2 boat owners are guidance to seek competent advice from a suitable boatyard or marine surveyor.

Check 7.3.4

The first part of the Requirement at Check 7.3.4 is that Cylinder locker drain lines must be continuous and must fall continuously to the drain outlet in the hull so as not to retain escaped LPG vapour. By falling continuously drain lines cannot retain water which, if it were to lie in the drain line, could block it. The following drawings provide added clarity.

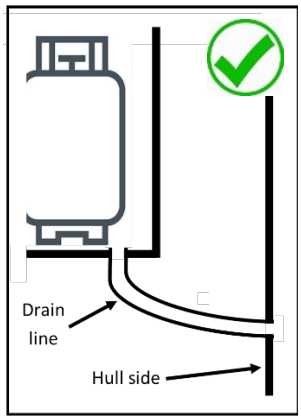


Fig 4a. The drain line falls continuously.

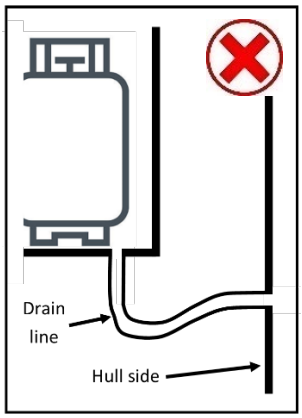


Fig 4b. There is a U bend in the line which could trap water.

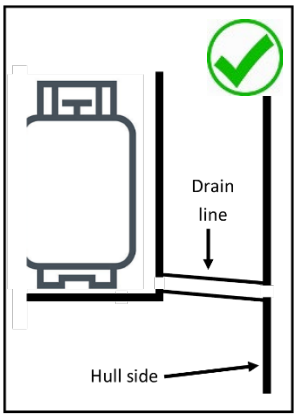


Fig 4c. The drain line has a very slight continuous fall.

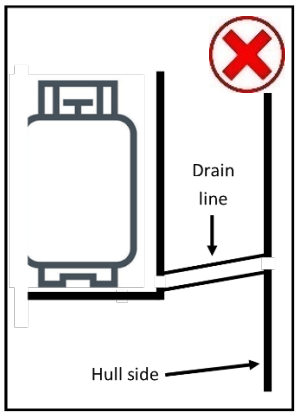


Fig 4d. The drain line rises towards the outlet.

2.6 LPG pipe joint securing

According to Check 7.8.4, fixings are required on all sides of joints.

All LPG pipe joints must have fixing clips attached no more than 150mm from each joint connection.

The ‘P’ clip on the far right of this image is not compliant with the Requirement.

Joints secured by proprietary integral fixings such as mounting plates or bulkhead fittings can be considered as meeting this Requirement.

Bulkhead coupling

Foot mounted hose nozzle fitting

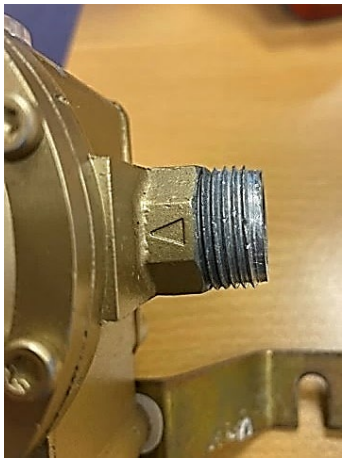
Foot mounted ball valve

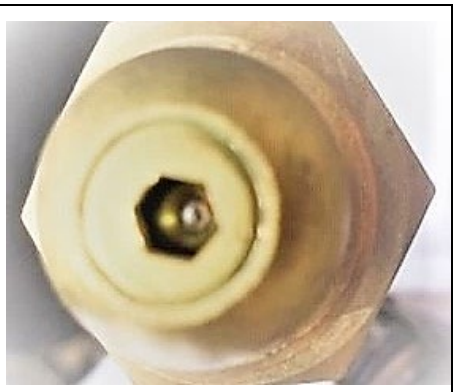
2.7 Non return valves

In circumstances where two or more cylinders are connected on the high-pressure side, a non-return valve (NRV) is required to be fitted in each connection.

It may not always be obvious whether a non-return valve is fitted or not. Most automatic changeover devices will have them, some double wall blocks incorporate them, and some pigtails are supplied with them. Here are some tips to help identify the presence of NRVs.

The wall block in the image is marked with the words 'NRV' to the left and an arrow is marked to the right. The inclusion of the NRV may be indicated by an arrowhead, triangle, or wording. Arrow symbols and triangles will invariably point in toward the device.	

This changeover regulator is marked with a 'triangle' symbol.	
This auto-changeover regulator is marked with two arrow symbols	 

		
A label may be attached to the hose identifying that an NRV is fitted in the POL connection.	Another example of a label attached to the hose identifying that an NRV is fitted in the POL connection	If no label is present and no NRV identified in the wall block or changeover regulator; and, if the owner or their representative is present to disconnect the pigtails, the presence of an NRV can also be identified by a visual examination of the POL connection. Typically, the NRV in the propane POL connection would have a hexagonal shape to it and a ball bearing behind the hexagonal cut-out may also be seen.

In some instances, confirmation of the presence of NRV's will only be possible by physical disconnection of the propane POL connector or butane pigtail; or disconnection of the W20 end of a high-pressure pigtail from a wall block or changeover regulator.

If the owner or the owner's representative is not present, Check 7.7.2 is to be marked 'not verified' until arrangements are made to confirm the presence of NRV's.

Examiners are not permitted to remove the hose from the cylinder during an Examination

There is no Requirement for Examiners to test if the NRVs are functioning.

2.8 Appliance isolation valves

Appliance isolation valves are used where there are appliances connected by hose, and are in place to be able:

- to isolate the appliance's gas supply in the event either the hose has become damaged or its condition has otherwise deteriorated, risking an escape of LPG vapour; or
- to close the gas supply to the appliance whilst the appliance is serviced or temporarily removed for cleaning, etc.

Check 7.11.1 – 2nd Applicability

At Check 7.11.1 the Requirement is that appliances connected by hose must be provided with an individual shut-off valve in the vicinity of the appliance. However, the 2nd Applicability permits hob/oven arrangements to be treated as one appliance for the purposes of the Check. This means that:

1. where a hob and separate oven (or oven/grill) are the only appliances on board, and one or both appliances are connected by hose, the cylinder valve(s) may be taken as being the appliance isolation valve. The drawing at Figure 5 provides added clarity.

2.

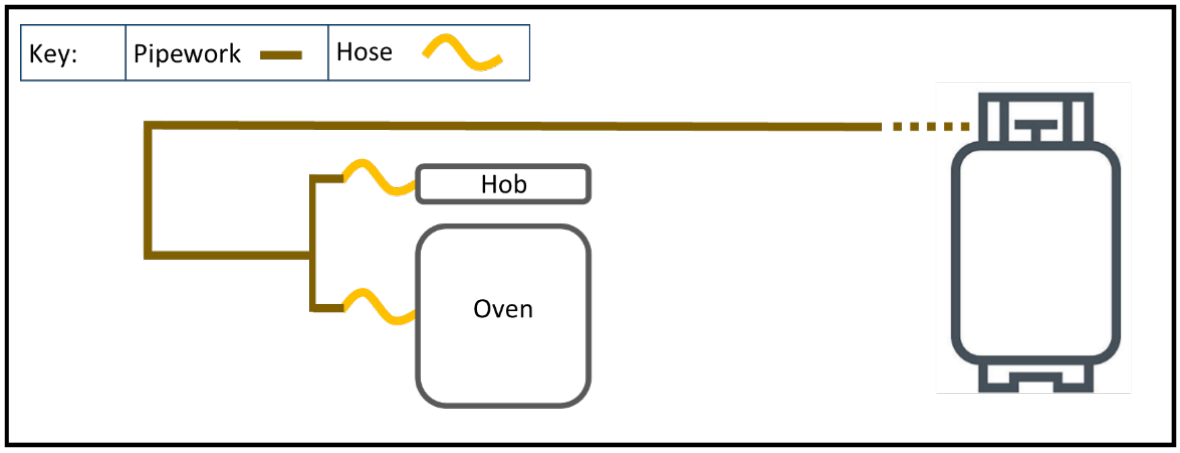


Fig 5. This scenario is compliant at Check 7.11.1. Where a separate hob and oven (or oven/grill) are the only appliances the cylinder valve may be taken as the appliance isolation valve irrespective of the distance between the appliances and the cylinder(s).

3. where there are more LPG appliances than just a hob and separate oven (or oven/grill) a single valve may act as the appliance isolation valve for the hob and separate oven provided it is positioned within a spur that only supplies the hob and separate oven. The drawings at Figure 6 and 7 provide added clarity.

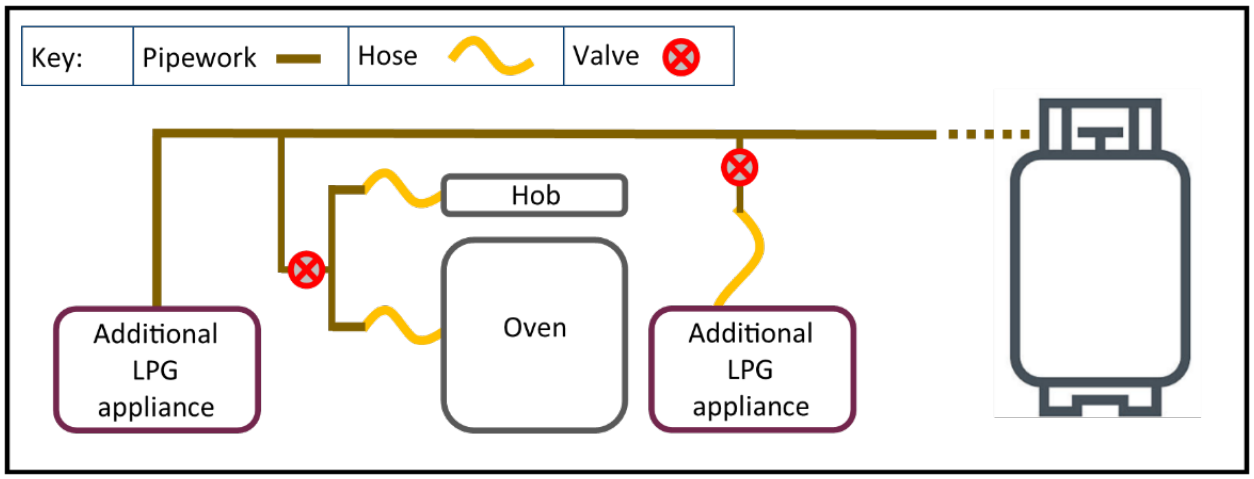


Fig 6. This scenario is compliant at Check 7.11.1. Where there are more appliances than just the separate hob and oven (oven/grill) a single isolation valve may serve the hob and oven but it must be in the spur that supplies the two appliances.

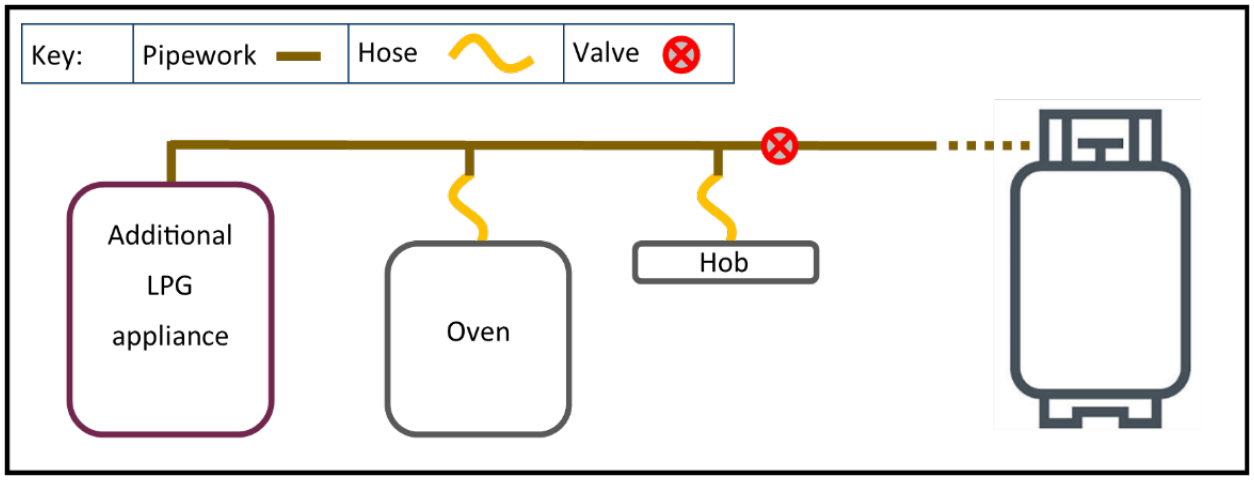


Fig 7. This scenario is not compliant at Check 7.11.1. The in-line valve is not positioned within a spur that only supplies the hob and separate oven.

8 Appendix – ECP Part 8 – Supporting Information

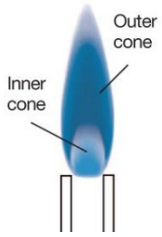
Appliances and flues

1 – Essential material needed by BSS Examiners to be able to apply certain Part 8 Checks

1.1 LPG burner flame trouble chart

At Check 8.8.1 Examiners must assess the flame picture at each LPG appliance burner when **all appliance burners** in the system are operating at their maximum setting at the same time. If you observe one or more of the poor burner flame picture indicators listed below, a fault must be recorded at Check 8.8.1R

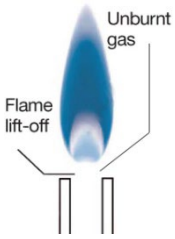
Indicator	Possible cause
Yellow flame tip	• Insufficient air • Oversize injector
Orange flame	• Particles of dust or dirt being carried through burner ports
Individual flames lift above burner ports	• Too much primary air • Burner ports partially blocked • Too much pressure
Delayed ignition or slow lighting	• Pilot flame incorrectly located • Too much primary air
Smell of gas	• Gas leak • Delayed ignition • No combustion • Cylinder running out of gas
Combustion odour	• Lack of secondary air • Flame impingement • Cylinder running out of gas
Floating flame	• Lack of secondary air • Oven burner gas rate too high • Obstructed flue-way • Draughts



Gas and air in correct proportions

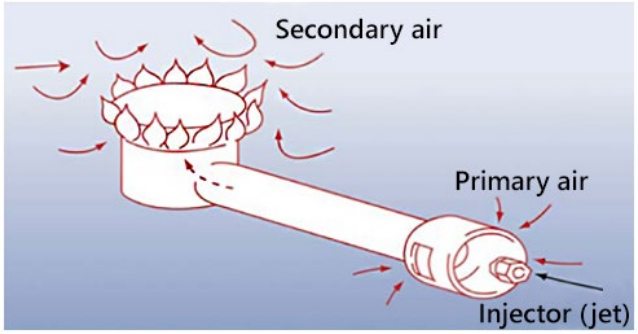
Too much gas or too little air

Too much air or too little gas



Possible causes

- Pressure too high
- Too much primary air

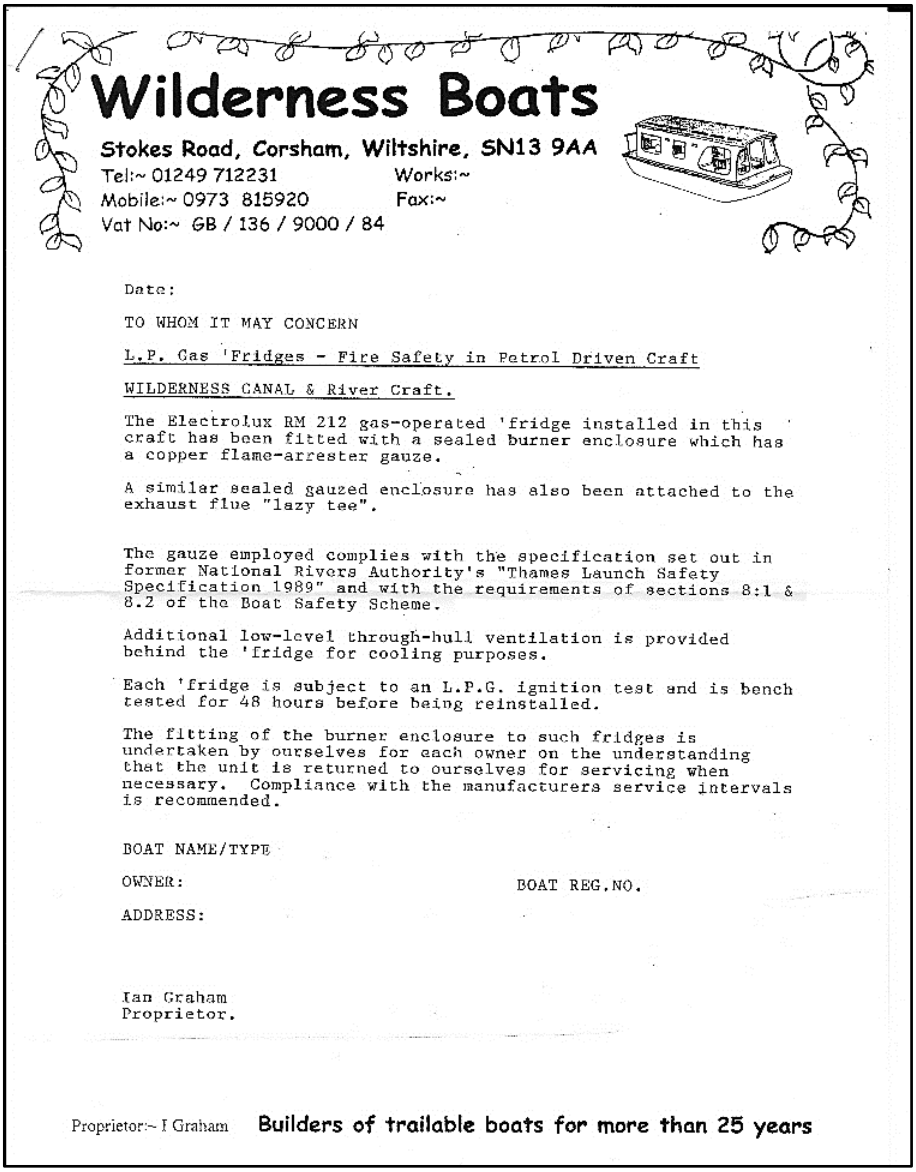


1.2 Wilderness Boats conversion of the Electrolux RM 212 fridge

At Check 8.2.1 Examiners may have to identify a Wilderness Boats modified Electrolux RM212 LPG fridge.

During the 1980/90s Wilderness Boats modified approximately 70 RM212 fridges to seal the burner and flue system to enable the appliances to be used on petrol-engined boats (mostly the Wilderness Trailboat).

The modified fridges were supplied with a written declaration, an example of which is shown. Some fridges may also carry a label confirming they were modified by Wilderness Boats.



Wilderness Boats

Stokes Road, Corsham, Wiltshire, SN13 9AA
Tel:~ 01249 712231 Works:~
Mobile:~ 0973 815920 Fax:~
Vat No:~ GB / 136 / 9000 / 84

Date:

TO WHOM IT MAY CONCERN

L.P. Gas 'Fridges - Fire Safety in Petrol Driven Craft

WILDERNESS CANAL & River Craft.

The Electrolux RM 212 gas-operated 'fridge installed in this craft has been fitted with a sealed burner enclosure which has a copper flame-arrester gauze.

A similar sealed gauzed enclosure has also been attached to the exhaust flue "lazy tee".

The gauze employed complies with the specification set out in former National Rivers Authority's "Thames Launch Safety Specification 1989" and with the requirements of sections 8:1 & 8.2 of the Boat Safety Scheme.

Additional low-level through-hull ventilation is provided behind the 'fridge for cooling purposes.

Each 'fridge is subject to an L.P.G. ignition test and is bench tested for 48 hours before being reinstalled.

The fitting of the burner enclosure to such fridges is undertaken by ourselves for each owner on the understanding that the unit is returned to ourselves for servicing when necessary. Compliance with the manufacturers service intervals is recommended.

BOAT NAME/TYPE

OWNER: BOAT REG.NO.

ADDRESS:

Ian Graham
Proprietor.

Proprietor:~ I Graham **Builders of trailable boats for more than 25 years**

Wilderness Boats converted three models of the Electrolux RM 212, model A, B and F, shown below:

RM 212B

RM 212F

RM 212F

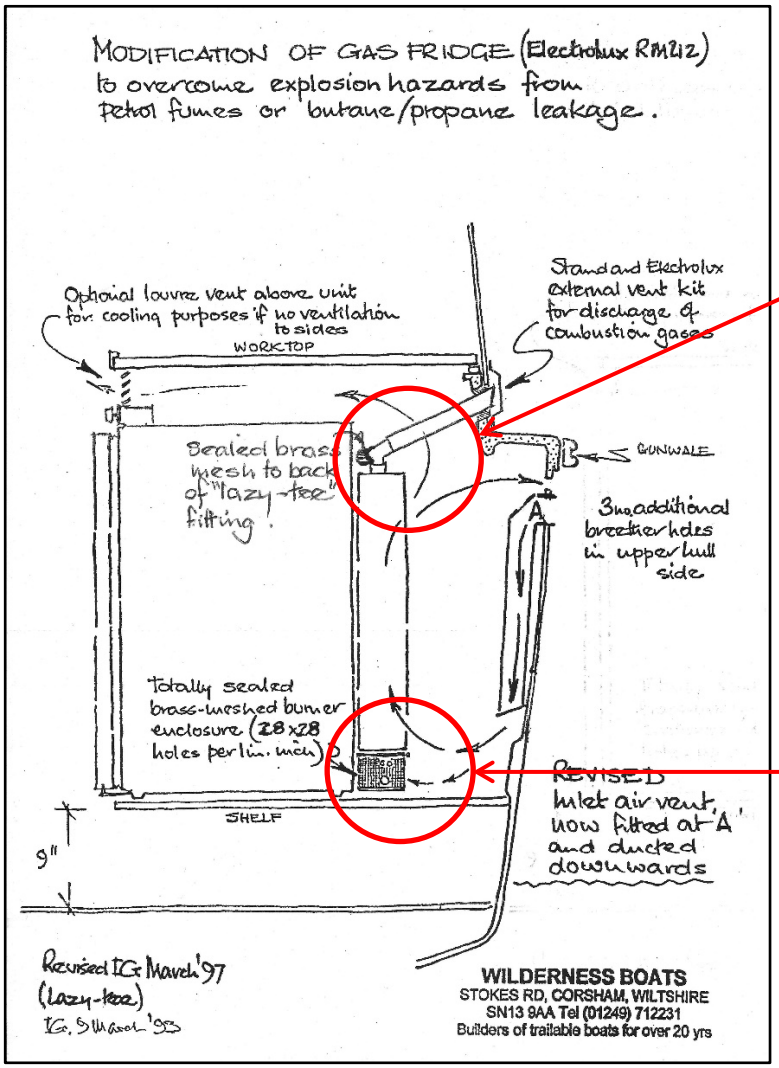
At Check 8.2.2 Examiners must also see documentary evidence from Wilderness Boats, or a Gas Safe registered engineer that the fridge has been serviced within the 12 months prior to the date the Examination.

The documentary evidence from Wilderness Boats must be on its headed paper, and any documentary evidence from a Gas Safe registered engineer will need to show the name and/or, the name of the company, and a Gas Safe registration number.

Check 8.2.2 **also** requires Examiners to see the flame arresting mesh on the flue pipe's 'lazy tee', and the flame arresting mesh that encloses the burner.

As originally installed in Wilderness Trailboats access was made through the surrounding structures to allow Examiners visual access to the 'lazy tee' and the burner. Examiners are only required to establish that flame arresting mesh is present on the 'lazy tee' and around the burner.

The following sketch shows the general location of the 'lazy tee' and the burner, and the photographs show close-ups of both items.



Additional information on the Wilderness Boats conversation of the Electrolux RM212 fridge can be found in the Help Centre on the BSS Examiner Community.

8a Appendix – ECP Part 8 – Supporting Information

Appliances and flues

Requirements for fixed ventilation (Check 8.9.1)

Fixed ventilation is ventilation that cannot be closed without the use of tools.

Note 1 – Ventilators, doors, windows, hatches and any other openings, which can be fully closed, must not be included in the ventilation calculation.

Note 2 – Ventilators, doors, windows, hatches and any other openings, modified so they cannot be fully closed without the use of tools should only have their minimum fixed ventilation area included in the calculation.

Factors Affecting Total Effective Area of Fixed Ventilation

The total effective area of fixed ventilation' is: the total area of fixed ventilation provision, as measured.

Each ventilator, door, window, hatch and any other openings should be measured carefully to determine their individual effective area of fixed ventilation.

Careful examination must be made of each ventilator to determine the presence of any device which would reduce the clear air opening e.g. filter, insect screen, fan blades.

Where filters or screens are fitted, they must also be in a clean and serviceable condition as partial or complete blockage of the clear air openings could make the ventilator totally ineffective.

Louvered doors are a common form of providing fixed ventilation and the effective area needs to be carefully measured.

The total effective area of fixed ventilation is designed to provide:

- combustion air for appliances that are not room-sealed;
- for the evacuation of combustion products from appliances that are not room sealed;
- renewal of fresh air for habitation and comfort.

Calculation of Fixed Ventilation Requirements

The formula used to calculate the fixed ventilation requirement is derived from PD 54823 Annex C (Guidance for the design, commissioning, and maintenance of LPG systems in small craft), but as extended by BS 8511 Annex A (Code of Practice for the Installation of Solid Fuel Heating and Cooking Appliances in Small Craft) to address solid fuel stoves and other appliances.

The formula for calculating the fixed ventilation requirement 'V' (in mm^2) is as follows:

V = [2200 x U] + [650 x P] + [550 x H] + [440 x F], where:

U = input rating for all unflued appliances (inc. cookers) (in kW)

P = number of persons for which the accommodation space is designed

H = nominal output rating of all solid fuel appliances (in kW)

F = input rating for all open-flued appliances (in kW)

The calculation is to be specifically made for each installation with reference to appliance input ratings (output ratings for solid fuel appliances) taken from manufacturer's plates, manuals or accumulated reference lists. It is not acceptable or appropriate to estimate or guess fixed ventilation requirements.

Examiners will retain a written record of the ventilation calculation for each Examination made. The record will detail all appliances and ratings and whether it is flued or not.

Open-Flue and Closed-Flue Appliances

From the Glossary definition, 'open-flue' appliances take their air for combustion from the space in which they are installed. Open-flue appliances can be identified by the presence of a draught diverter which provides a draught break between the primary flue on the appliance and the secondary flue connecting the draught diverter and the flue terminal.

Closed-flue appliances also take their air for combustion from the space in which they are installed, but the flue is closed from the space due to the absence of a draught diverter. Because closed-flue appliances take air for combustion from the space in which they are installed, such appliances must be included within 'F', when making the calculation.

Solid Fuel Appliances

Solid fuel appliances usually have closed-flues, as do many central heating boilers.

In the absence of manufacturer's details, an output rating of 5kW may be assumed as forming a reasonable basis for the fixed ventilation requirement for solid-fuel appliances.

Application

The calculation should be applied to any part of the vessel containing a fuel burning appliance that:

- is normally divided as a separate compartment;
- can be temporarily divided except by curtaining.

High-Level and Low-Level Ventilation

The total effective area of fixed ventilation (at least up to the calculated fixed ventilation requirement) should be divided as equally as practicable between high-level and low-level.

Where the total effective area of fixed ventilation exceeds the calculated fixed ventilation requirement there is no Requirement for the excess fixed ventilation provision to be divided as equally as practicable between high-level and low-level.

Low-level ventilation can be achieved by spillage of cold air from vents in doors and/or bulkheads or by means of ducting from a higher level.

9 Appendix – ECP Part 9 – Supporting Information

Pollution prevention

1 – Essential material needed by BSS Examiners to be able to apply certain Part 9 Checks

There is currently no essential material supporting the Part 9 Checks.

2 – Additional information to support BSS Examiners' understanding of the BSS Requirements

2.1 Bilge water filters with 5 parts per million (ppm) performance levels

For bilge water filters made by the following two main UK manufacturers, all models can be presumed to meet the 5ppm performance level as the BSS has confirmation in the form of manufacturer declarations. The manufacturer's declarations can be seen in the Help Centre on the BSS Examiner Community.

- Wavestream
- Bilgeaway

Wavestream bilge filters
There are currently four models in the range:
Micro, WSS 1, WSS 2 and WSS 3.

Bilgeaway bilge filters
There are currently four models in the range:
Midi (separate photo), 10inch, 20incg and 20inch chrome.

For other makes and models of bilge water filter Examiners must assume that they do not meet the BSS Requirements unless supported by a suitable declaration from the manufacturer expressly confirming 5ppm performance level.

2.2 Recognising overboard discharge lines and the presence of an appropriate closable valve

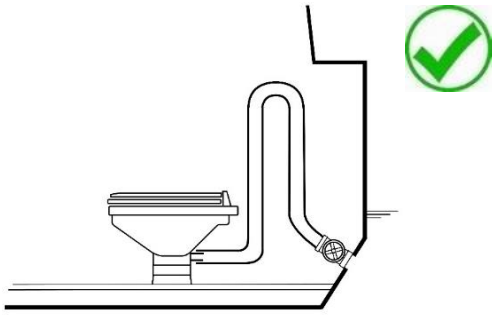
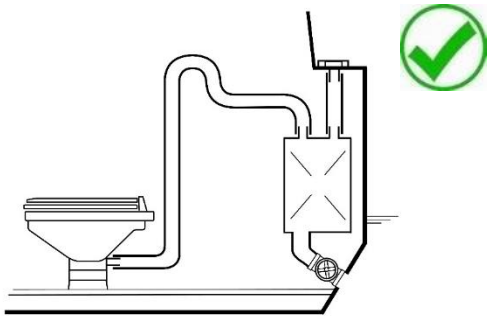
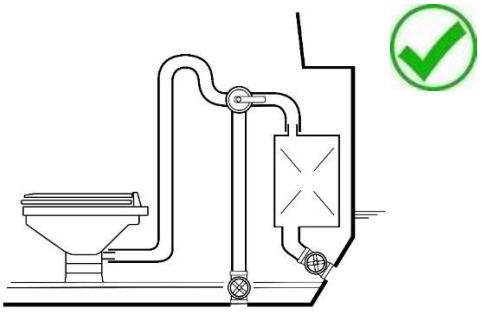
'Overboard discharge' means that the contents of the toilet go overboard into the watercourse. For boats having cassette or composting toilets or, holding tanks that only discharge via a shore pump-out, the toilet contents cannot be pumped into the waterway and therefore the Check is not relevant.

The plumbing arrangements on toilets with overboard discharges can be difficult to identify and follow and especially in cases where the owner is not on board to ask. Examiners may need to strive to follow the route of toilet discharge lines in out of view locations such as lockers, cupboards and in bilges.

Examiners should not presume that the presence of a holding tank with a pump-out deck fitting means that there is no overboard discharge line in the system. As shown by the accompanying drawing, some boats will have both overboard discharge and a shore pump-out facility.

Closable valves will generally be found at the through-hull fitting. Valves in this location protect the boat from the sinking risk should the hose connection fail and will generally be readily accessible to allow emergency operation. Very occasionally there may be no valve at the through-hull fitting, but there may be a valve at another point along the discharge line.

The following are examples of toilet and holding tank arrangements with overboard discharge lines.

Simple sea toilet with a gate valve at the through-hull fitting. Compliant.	
Holding tank with overboard discharge and shore pump out facility. The overboard discharge is fitted with a valve at the through-hull fitting. Compliant.	
Holding tank with overboard discharge and an overboard discharge bypass arrangement. Both overboard discharge lines have a valve at the through-hull fitting. Compliant.	
Holding tank with overboard discharge and shore pump out facility, and a discharge bypass arrangement. Even though there is no closable valve at the bypass line's through-hull fitting, the arrangement is compliant at Check 9.2.1. because the Y valve can be used to close off the bypass line and there is a closable valve on the holding tank's overboard discharge line.