

Liquefied Petroleum Gas on leisure craft

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This is Part 2 of a two-part article: the first part appeared in our last issue. Ed.

Pipework

The only correct solid piping to use with LPG is soft solid drawn copper and, occasionally, stainless steel piping. The copper is delivered in coils and is bent to the form necessary. Plumbing grade copper (as used for hot water central heating) is **not** of the correct specification and pinhole corrosion can occur when using this piping with propane.

All flexible piping should be of the correct grade, which in the UK is marked **BS 3212 type 2 High Pressure**. Flexible connections to cookers etc may utilise armoured **BS 3212 Lunken** pipe, which has a metal tag label. No other piping is acceptable, mainly because of its porosity to the small LPG molecules and limited heat resistance. In the UK we will not accept low-pressure piping on any marine application and only piping to BS 3212 type 2 or EN 1763 Class 3 or 4 (high pressure) is acceptable. The EN piping will be phased in as the BS stuff is phased out.

Pipes must be joined by LPG compression fittings, using copper olives inside the cone nuts. Brass olives and plumbing-grade brass fittings gradually disintegrate with the corrosive effects of the damp LPG, and also any ammonia present in soapy water used for leak detection. In some circumstances hard (silver) soldered joints are acceptable, but soft soldered joints of the plumbing type are unreliable because of the poor qualities of lead-based solders. A gas system should have as few joints as possible.

Appliances

Appliances are divided into two types: open-flued (eg cookers, instantaneous water heaters and most fridges) and room-sealed, where all the air for combustion and all of the flue gases have no direct connection with the cabin spaces and are ducted into the appliance (eg modern Electrolux fridges and Alde central heating boilers).

Under the RCD requirements, open-flued LPG appliances are acceptable only for cooking. All other appliances must be room-sealed. All burners must be fitted with flame failure devices to cut off the gas supply if the flame is blown out.

Boats built before the RCD became mandatory (16 June 1998 for nearly all new boats built within the EU) may continue to use their open-flued appliances as long as they can be serviced on board the craft. In the UK, if a CORGI (registered) gas fitter removes a Paloma or an old type fridge from a boat, he cannot by law re-install it. Such existing installations are covered by the "grandfather" Annex A of **BS 5482 Part 3**. If you have to fit a new gas appliance, it must comply with the latest standards, so open-flued water heaters etc have limited futures.

The flame characteristics of all burners should be regularly checked. Flames should be a clear blue colour with an inner lighter cone. They should not roar or pop or be unstable and lift off the burner. All of these indicate problems with the gas pressure or gas-air mixture. If the flames are yellow like a candle, and leave soot in chimneys and on cooking pots, **stop using the burner**. It will be producing carbon monoxide (CO), which can kill you without any prior warning. This is



why the most dangerous appliance on most boats is the poorly maintained gas fridge, because that puts out CO at night when crew are asleep. Boat crews die every year in poorly ventilated craft from the effects of such innocuous-looking appliances.

Instantaneous gas water heaters such as Palomas need 20 times more air for combustion than a human being and so should not be sharing a small enclosed space with anybody. They should not be installed in shower compartments unless the door is fully louvred to allow lots of air in. Pilot flames consume a small amount of air but when a flue is fitted (mandatory in the UK) the small flame assists ventilation because it provides thermal uplift: ie an assisted ventilator which becomes a flue when the unit is being operated.

Ventilation

All boats must have sufficient ventilation to support combustion of all of the oxygen-burning items on board — the appliances and the crew. If the boat regularly goes to sea, the vents may be closable, but vents on inland waterway craft must be fixed open.

The ventilation is calculated from the Kw of the appliances and is divided equally between high- and low-level ventilation. A four-berth boat with a four-burner cooker, an instantaneous water heater, a solid fuel stove and a gas fridge will require a total of at least 66 sq ins of fixed ventilation. That will usually be installed as 33 sq ins through the roof and 33 through the bottom of external doors or ducted down from cabin sides. The area of any ventilator is measured as the effective free area — not the hole you cut to fit it! On this basis most brass mushroom vents give 8 sq ins, a flat UFO-type vent is less than 3 sq ins and the slots in louvre vents are measured individually.

Testing

The tests on existing LPG systems are

- a soundness test for gas leakage
- flue testing to ensure that flues are not blocked and are effective at clearing the products of combustion
- observation of the flame patterns on all burners.

Soundness testing is carried out with a manometer (a water-filled U tube), which also gives details of the performance of the gas regulator. To do this a gas test point must be installed if there is not already one fitted to a gas appliance. Increasingly in the UK owners want to routinely test their own systems and are thus fitting bubble testers, which are quick and easy to use without tools. We have found that about 30% of all boats tested have a detectable gas leak. Most of these are small and in a well-ventilated boat do not allow the explosive mixture of 2%+ to be reached.

Hopefully, the contents of this article are not too alarming. Most gas systems function well for many years despite the probability of having several small gas leaks from fittings and cooker taps. Perhaps it's now time for you to give your boat a gas health check and allow this flexible and efficient fuel to continue to give you good service well into the future.

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