No. : 1010

香 港 商 船 通 告

HONG KONG MERCHANT SHIPPING NOTICE

Use of Liquefied Petroleum Gas (LPG) in Domestic Installations and Appliances on Ships, Fishing Vessels, Barges, Launches, and Pleasure Craft

Explosions, Fires and Accidents Resulting From Leakage of Gas

To : Shipowners, Masters, Agents and Classification Societies

Summary

The purpose of this Notice is to give guidance on the safe use of liquefied petroleum gas (LPG) in domestic installations and appliances on ships to avoid explosions, fires and asphyxiation resulting from leakage of gas from appliances, storage containers or defective fittings. Installation requirements are also given in this Notice.

1. In view of the considerable use of bottled hydrocarbon gases on smaller cargo ships, fishing vessels, tugs, barges, launches and pleasure craft for cooking, water and space heating, etc., the Department wishes to draw attention to the possible dangers which may accompany their use and to the need for installations to comply at least with the requirements of British Standards Institution publication BS 5482: Part 3: 1979 - The code of practice for domestic butane and propane gas-burning installations; Part 3-Installations in boats, yachts and other vessels. Individual appliances and fittings should comply with the relevant British Standard Specifications listed in BS 5482: Part 3: 1979, some of which are given at Annex 1.

2. The possible dangers associated with the misuse of such installations include fire, explosion and asphyxiation due to the leakage of gas from appliances, storage containers or defective fittings or due to an accumulation of gas following flame failure. Incidents may result in loss of life and sometimes cause serious material damage. The siting of gas consuming appliances and storage containers and the provision of adequate ventilation of the spaces containing them are consequently most important.

3. In addition to the risk of asphyxiation should the leakage or accumulation of gas occur in an enclosed space, there is also the risk of carbon monoxide poisoning when the appliance is in use. It is dangerous to sleep in spaces where gas-consuming open-flame appliances are left burning.

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4. Furthermore, open-flame heaters with non-enclosed burners may present a serious hazard from the fire and explosion aspects and if possible, their use should be avoided.

5. The gases most commonly used for domestic Liquefied Petroleum Gas (LPG) installations in ships are butane or propane conforming to BS 4250-Commercial butane and propane. A stenching agent is added to enable the presence of gas to be detected by smell even when its concentration in air is below its lower limit of flammability.

6. It is important to remember with LPG installations that the gases although heavier than air, if released, may travel some distance tending to fall to the bottom of a compartment. Here they diffuse and may form an explosive mixture with air, as in the case of petrol vapours.

7. A frequent cause of incidents involving LPG Installations is the use of unsuitable fittings or the replacement of items such as flexible hoses with temporary rubber or plastic tubing. It is essential that any repair or replacement part is in accordance with the original specification of the equipment as detailed in BS 5482: Part 3: 1979.

8. In view of the elements of danger in the use of LPG installations a warning notice in red should be displayed adjacent to each appliance to read as follows:

WARNING

1. **DO NOT LIGHT IF LEAKAGE IS SUSPECTED.**
2. **BEWARE OF ANY UNUSUAL SMELL AS THIS MAY INDICATE LEAKAGE FROM THE APPLIANCE.**
3. **DO NOT CHECK FOR LEAKS WITH A NAKED FLAME.**
4. **MAINTAIN GOOD VENTILATION AT ALL TIMES.**

9. In conjunction with any LPG Installation the provision of an automatic gas detection and alarm system of a reliable type is strongly recommended and is absolutely necessary when a cooking or other gas consuming appliance is fitted in sleeping or other spaces below decks. It is essential that any electrical equipment associated with the gas detection and alarm system should be certified as being flame-proof or intrinsically safe for the gas being used.

10. As expressed above LPG installations should at least comply with the requirements of BS 5482: Part 3: 1979 but the Department also wishes to stress the importance of obtaining expert advice regarding the fitting of LPG Installations and of the need to ensure that such installations and associated alarm systems receive adequate (and expert) maintenance in service.

11. BS 5482: Part 3: 1979 deals very fully with all aspects of LPG Installations but some general comments are made in Annex 2 as all users of such installations may not have access to this publication.

12. Attentions is also drawn to the requirements of Regulation 6(6) of the Merchant Shipping (Seafarers) (Crew Accommodation) Regulation.

Marine Department
Multi-lateral Policy Division

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附件 1
ANNEX 1

SELECTION OF RELEVANT BRITISH STANDARD SPECIFICATIONS

BS 2491	Domestic cooking appliances for use with liquefied petroleum gases.
BS 2773	Domestic single room space heating appliances for use with liquefied petroleum gases.
BS 2871	Copper and copper alloys. Tubes. Part 1. Copper tubes for water, gas and sanitation. Part 2. Tubes for general purposes.
BS 2883	Domestic instantaneous and storage water heaters for use with liquefied petroleum gases.
BS 3016	Pressure regulators and automatic change over devices for use with liquefied petroleum gases.
BS 3212	Flexible rubber tubing and hose (including connections where fitted and safety recommendations) for use in LPG vapour phase and LPG/air installations.
BS 3605	Seamless and welded austenitic stainless steel pipes and tubes for pressure purposes.
BS 4104	Catering equipment burning liquefied petroleum gases.
BS 4368	Carbon and stainless steel compression couplings for tubes. Part 1. Heavy series. Part 3. Light series (metric).
BS 5045	Transportable gas containers. Part 2. Steel containers up to 130 litres water capacity with welded seams.
BS 5314	Specification for gas heater catering equipment.
BS 5386	Specification for gas heating appliances. Part 1. Gas burning appliances for instantaneous production of hot water for domestic use.

GENERAL COMMENTS ON LPG INSTALLATIONS

1. Stowage of gas containers

Wherever possible gas containers should be stowed on the open deck or in a well-ventilated compartment on deck so that any gas which may leak can disperse rapidly. Where deck stowage is impracticable and the containers have to be stowed in a compartment below deck, such a space should be adequately ventilated to a safe place and any electrical equipment in the space should be of flame-proof construction. In all cases stowage should be such that the containers are positively restrained against movement, preferably in secure mountings specially designed for the purpose. On multiple container installations a non-return valve should be placed in the supply line near to the stop valve on each container. If a change-over device is used it must be provided with non-return valves to isolate any depleted container. Where more than one container can supply a system it should not be put into use with a container removed. Where stowage below deck or use of appliances in accommodation is unavoidable, an added precaution is the provision of remote closure of the main gas supply from the containers. Containers not in use or not being fitted into an installation should always have the protecting cap in place over the container valve. Containers should never be lifted by means of a rope around the valve.

2. Stowage of spare and empty gas containers

It is important that the stowage of spare and empty gas containers receive the same consideration as the positioning of operating containers, particularly with regard to ventilation and electrical equipment should the spare containers be stowed below decks.

3. Automatic Safety Gas Cut-off Devices

A device should be fitted in the supply pipe from the gas container to the consuming appliances which will shut off the gas automatically in the event of loss of pressure in the supply line, e.g. should a connecting pipe fracture. The device should be of a type which requires deliberate manual operation to re-set it to restore the gas supply. It is strongly recommended that all gas consuming devices should be fitted, where practicable, with an automatic shut-off device which operates in the event of flame failure.

4. Open-flame heaters

Where such appliances are installed, they should be well secured so as to avoid movement and be preferably of a type where the gas flames are isolated in a totally enclosed shield, arranged in such a way that the air supply and combustion gas outlets are piped to the open air.

5. Fittings and Pipework

Solid drawn copper alloy fittings or stainless steel tube with appropriate compression or screwed fittings are recommended for general use for pipework for LPG installations. Aluminium or steel tubing and any materials having a low melting point such as rubber or plastic should not be used. Lengths of flexible piping (if required for flexible connections) should be kept as short as possible, be protected from inadvertent damage and comply with the appropriate British Standard.

6. Ventilation Arrangements

(a) It is highly desirable that compartments containing a gas-consuming appliance should not have access doors or openings direct to accommodation spaces or their passageways, but where this is impracticable it is advisable that mechanical exhaust ventilation trucked to within 12 in. of the floor adjacent to the appliances and adequate inlet ventilation be provided.

(b) Compartments containing a gas-consuming appliance which are situated upon an open deck with direct access to the adjacent deck and with no opening direct to accommodation spaces or their passageways should also be adequately ventilated, preferably by mechanical means.

(c) In pleasure craft and in some small ships where it may be impracticable to provide the mechanical ventilation referred to in sub-paragraphs (a) and (b) above, all compartments where gas-consuming devices are used should have adequate natural ventilation of a type which cannot readily be closed and which will prevent a dangerous accumulation of gas. The ventilation should provided for extraction of any gas which might leak from the system, as well as providing a fresh air supply. Since the gas which is heavier than air, tends to fall to the lowest level, exhaust ventilation openings should be led from a position low in the space. Such ventilation might be provided by wind-actuated self-trimming cowls or rotary exhauster heads.

(d) When mechanical ventilation is fitted to any space in which gas containers or gas-consuming appliances are situated, the materials and design should be such as will eliminate incendive sparking due to friction or impact of the fan impeller with its casing. Electric motors driving fans should be situated outside the space and also, whenever practicable, outside the ventilation trunking and clear of outlets, but suitably certified flame-proof motors should be used if this cannot be achieved. Ventilator outlets should be in a safe area free from ignition hazard. Ventilation systems serving spaces containing storage containers or gas-consuming appliances should be separate from any other ventilation system. Mechanical exhaust ventilation trucking should be led down to the lower part of the space adjacent to the appliance.

(e) Notwithstanding (b) above, Regulation 32(11) of Part I of the Merchant Shipping (Seafarers) (Crew Accommodation) Regulation requires mechanical exhaust ventilation to be provided for galleys in any ship over 1,000 tons gross and Regulation 25(9) of Schedule 6 to the same Regulation for ships registered before 1 July 1979 requires mechanical exhaust ventilation in any galley.

(f) In cases where loss of life has occurred due to asphyxiation or carbon monoxide poisoning the ventilation system has been found to be deficient because ventilators have been interfered with or neglected. It is not unusual to find ventilators deliberately blocked, and butterfly and sliding ventilators have been found to be in the closed position and immovable. The importance of adequate ventilation of spaces containing gas consuming appliances cannot be too strongly emphasised and on no account must a ventilation system be interfered with so as to prevent it functioning correctly.

(g) Whilst adequate ventilation is a prerequisite for safety, consideration should be given to the siting of gas-consuming appliances in relation to the ventilating system such that air turbulence does not bring about the extinction of unshielded gas flames and thus permit the escape of gas.

7. Gas Detection

Suitable means of detecting the leakage of gas should preferably be provided in each compartment containing a gas-consuming appliance and where this is a detector, it should generally be securely fixed in the lower part of the compartment in the vicinity of the gas-consuming appliance. Any gas detector should preferably be of a type which will be actuated promptly and automatically be the presence of a gas concentration in air not greater than 0.5 per cent (representing approximately 25 per cent of the lower explosive limit) and should incorporate an audible and a visible alarm, although on small craft a portable manually operated detector may be used. Where electrical detection equipment is fitted it is essential that it should be certified as being flame-proof or intrinsically safe for the gas being used. In all cases where detection and alarm equipment are used, the alarm unit and indicating panel should be situated outside the space containing the gas storage and consuming appliances.

Similar provision for automatic gas detection and alarm should also be made in small vessels, such as pleasure craft and barges, if a cooking or other gas-consuming appliance is fitted in sleeping or messing spaces below deck.

Detectors can be rendered unsafe for use in explosive atmospheres by inexpert servicing, particularly in respect of arrangements for sealing off the detection chamber. Any maintenance should therefore be carried out by persons competent to do so or by replacement of the detection unit.

In all cases the arrangements should be such that detection devices can be tested frequently whilst the craft is in service.

8. Emergency Action

A suitable notice detailing action to be taken when an alarm is given by the gas detection system should be displayed on board the craft. In addition, the information given should include the following:

(a) the need to be always alert for gas leakage;

(b) when leakage is suspected all gas-consuming appliances should be shut off at the main supply from the container and no smoking should be permitted until it is safe to do so. **NAKED LIGHTS SHOULD NEVER BE USED AS A MEANS OF LOCATING LEAKS;**

(c) the correct use and maintenance of fire extinguishing appliances of which an adequate number should always be carried;

(d) the need for users to be fully aware of the contents of the consumer instructions and emergency procedures issued in accordance with clause 22 of BS 5482: Part 3 : 1979.