

SRI LANKA STANDARD 1183 : 1998

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**SPECIFICATION FOR
DOMESTIC LIQUEFIED PETROLEUM GAS
(LPG) BURNING INSTALLATIONS
AT PERMANENT DWELLINGS**

SRI LANKA STANDARDS INSTITUTION

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AT PERMANENT DWELLINGS**

SLS 1183 : 1998

Gr. 14

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CONTENTS

CLAUSE	PAGE
0 Foreword	3
1 Scope	3
2 References	4
3 Definitions	4
4 Requirements	6
5 Inspection testing and user instructions	21

APPENDICES

Appendix A - (Informative) Testing of low pressure stage of installation	23
Appendix B - (Normative) Testing of high pressure stage of installation	27
Appendix C - (Normative) Testing of low pressure stage of installation of pressure loss	27
Appendix D - (Informative) Model emergency action notice or leaflet for users of liquefied petroleum gas	28

TABLES

	PAGE
Table 1 - Appliance heat input and gas rate	8
Table 2 - Recommended offtakes for tropical climates	9
Table 3 - Pipe size	14
Table 4 - BS steel pipe pipe sizing	14
Table 5 - Metric copper tube sizing	15
Table 6 - Polyethylene pipe sizing	15
Table 7 - Equipment lengths of pipe for fittings	16

FIGURES

Figure 1 - Cylinder location	10
Figure 2 - High pressure stage manifolds	12
Figure 3 - Installation test apparatus	24
Figure 4 - Bubble leak indicator	24
Figure 5 - High pressure leakage test	26
Figure 6 - Standard nozzle pressure point adaptor and washer for 8 mm (5/16) int.dia. flexible tubing	26

SRI LANKA STANDARD
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BURNING INSTALLATIONS AT PERMANENT DWELLINGS

FOREWORD

This standard was approved by the Sectoral Committee on LP Gas Industry and was authorized for adoption and publication as a Sri Lanka Standard by the Council, of the Sri Lanka Standard institution on 1998-12-10.

This standard deals with liquefied petroleum (LPG) gas installations at permanent dwellings and has been written in the form of a practice specification. To comply with this specification, users have to comply with all its requirements. Users may depart from recommendations, but this would be on their own responsibility and they would be expected to have good reasons for doing so.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or an analysis, shall be rounded off in accordance with **CS 102**. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this standard.

The Sri Lanka Standard Institution gratefully acknowledges the use of the following publications, in the preparation of this standard:

- 1 BS 5482 Domestic butane- and propane- gas- burning installations
Part 1: 1994 Specification for installations at permanent dwellings
- 2 IS 5116 : 1969 General requirements for domestic and commercial
equipment for use with LPG

1 SCOPE

This standard specifies the basic requirements for the installation at permanent dwellings of domestic systems using liquefied petroleum gases (LPG), whether from cylinders or bulk supply at a pressure of 2.8 kPa. It makes recommendations on the selection of materials, components and appliances, on design considerations, on installation requirements, on inspection and testing and on consumer instruction.

This standard applies to the installation of liquefied petroleum gas appliances which conform to recognized national standards.

This standard does not cover installation requirements of bulk tank supplies of liquefied petroleum gas.

Appliances incorporating their own gas supply are not considered to be part of the installation and are thus outside the scope of this standard.

Appendix A, Appendix B and Appendix C give test procedures for low pressure and high pressure stages of installation. Appendix D gives an example of an emergency action notice or leaflet for users of liquefied petroleum gas.

2 REFERENCES

- ISO 7 -1 Pipe threads where pressure tight joints are made on the thread- dimensions, tolerances and designations.
- BS 476 Fire tests on building materials & structures
- BS 2871 Specification for copper & copper alloy tubes
Part 2 : Tubes general purposes
- LPGA CP22(6) LPG piping systems, design and installation
- SLS 102 Presentation of numerical values
- SLS 712 Liquefied petroleum gas
- SLS 1171 Flexible rubber tubing, rubber hose and rubber hose assemblies for use in LPG vapour phase and LPG/air installations.
- SLS 1180 Pressure regulators and automatic change-over devices for use with LPG.
- SLS* Cooking appliances operated with LPG
- SLS* water heaters operated with LPG

3 DEFINITIONS

For the purpose of this standard, the following definitions shall apply:

3.1 permanent dwelling : Structure of a permanent nature, to which appropriate building regulations apply and which is used primarily for domestic purposes.

3.2 liquefied petroleum gas (LPG): Commercial butane or commercial propane or any mixture thereof complying with SLS 712.

NOTE

LPG presently used in Sri Lanka is commercial butane and commercial propane nominally in the ratio of 70:30 by weight.

* Sri Lanka standards being drafted or planned to be drafted.

3.3 high pressure stage : That part of the installation between the valve of the cylinder/tank and the inlet of the high pressure (1st stage) regulator.

3.4 intermediate pressure stage: That part of the installation between a first stage regulator sited at the tank or cylinder position and a second stage regulator.

3.5 low pressure stage: That part of the installation between the outlet of the single stage pressure regulator (or second stage regulator when an intermediate stage is used) and the inlet of the appliance.

3.6 cylinder: Portable and refillable vessel of approved design for the storage of LPG under pressure.

3.7 bulk tank: Permanently installed vessel of approved design for the storage of LPG under pressure which is filled in situ.

3.8 low pressure regulator: Apparatus for automatically maintaining a constant gas outlet pressure at the level recommended for the appliance in use.

3.9 manual reset low pressure cut-off valve: Device which automatically shuts off the gas supply in the event of the supply pressure falling below the predetermined value and requiring a manual operation to re-establish the supply.

3.10 atmosphere sensitive cut-off valve: Item of equipment designed to shut off the main gas supply to an appliance when the CO₂ content of the surrounding atmosphere exceeds a given level.

3.11 safety valve: Automatic valve incorporated to protect a cylinder or system against excessive pressure. It will vent to atmosphere when a predetermined maximum pressure is attained.

3.12 room-sealed appliance : Appliance which, when in operation, has the combustion system, including the air inlet and the products outlet, isolated from the room or space in which the appliance is installed.

4 REQUIREMENTS

4.1 Materials, components and appliances

4.1.1 Materials

4.1.1.1 Pipe work materials

The following materials shall be used for installation pipe work:

- a) solid drawn copper tube used with copper or copper alloy fittings;
- b) steel tube used with wrought iron, low carbon steel or malleable cast-iron fittings, or steel compression couplings and protected against corrosion, e.g. by galvanizing and painting;
- c) stainless steel tube and appropriate compression or screwed fittings.

Recommendations on 4.1.1.1

- 1) *Brass tubes conforming to BS 2871: Part 2 (designation CA 126 CZ 110) which have been given a final drawing operation after annealing are considered suitable.*
- 2) *Plastics pipes and fittings should not be used inside a dwelling.*
- 3) *Malleable cast iron fittings are only suitable for intermediate and low pressure stage installations.*
- 4) *The following materials are not recommended for general use for installation pipe work for the reasons shown in parenthesis:*
 - a) *aluminium (subject to corrosion);*
 - b) *lead and compositions of lead (subject to creep);*
 - c) *brass tubing (subject to seasonal cracking);*
 - d) *tubing of the type fabricated from sheet steel, coated internally and externally and wrapped (should not be used externally as it could be subject to atmospheric corrosion).*

4.1.1.2 Selection of materials

All material used in the installation shall conform to the requirements of the relevant Sri Lanka Standards.

Where no Sri Lanka Standard exists, materials should be of suitable quality and workmanship to fulfill their intended purposes.

4.1.2 Components

4.1.2.1 General

All components used in the installation shall conform to the requirements of the relevant Sri Lanka Standards.

Where no Sri Lanka Standard exists, materials should be of suitable quality and workmanship to fulfill their intended purposes.

4.1.2.2 Cocks and valves

A tapered plug cock shall be spring loaded and fitted with an operating handle designed to indicate clearly whether the cock is in the open or closed position. Valves should be marked with direction of rotation to open or close.

A cock at floor level shall be of either the drop fan or the loose key type or so positioned to prevent inadvertent operation.

Valves shall be of ball or diaphragm type, and they shall be suitable for use with LPG.

Needle valve and gate valves shall not be used as isolating valves.

Gas cock lubricants shall be of a type suitable for use with LPG, e.g. lubricants having a 25 per cent molybdenum disulphide base.

4.1.3 Selection of appliances

4.1.3.1 General

Only appliances which conform to the relevant Sri Lanka Standards shall be used. In the absence of such standard they should conform to a recognized national or international standards.

4.1.3.2 Domestic appliances

Domestic appliances shall conform to the relevant Sri Lanka Standards. In the absence of such standard they should conform to a recognized national or international standards.

4.2 Installation design

4.2.1 Layout of supply system

Layout shall be such that the length of pipe from the inlet of the gas supply to the highest rated appliance is as short as possible and all pipe runs, particularly at intermediate pressure stage, shall be as short as practicable.

4.2.2 Cylinder supply

Consideration shall be given to the guidance provided in Table 1 and Table 2, as appropriate to the appliance.

Recommendations on 4.2.2

Guidance given in Table 1 on the number of cylinders that should be provided in parallel to supply the installation is based on the evaporative capacity of the cylinders specified and on gas rates for different appliances. The number of cylinders necessary may be calculated by totaling the gas rate for each appliance in kilograms per hour and dividing this total by the recommended offtake for the size of cylinder chosen (see Table 2).

To ensure continuity of gas supply it is advisable to stock an equivalent number of replacement cylinders.

TABLE 1 - Appliance heat input and gas rate *

Appliance (1)	Heat input kW (2)	Gas rate(LPG) kg/h (3)
cooker (4 burners, oven & grill)	6.6	1.04
cooker(2 burner)	2.3	0.35
cooker(3 burner)	3.0	0.49
cooker(2 burner and grill)	3.3	0.56
Sink storage water heater	1.3	0.21
Boilers and air heater	8.5	1.41
Lighting appliance	0.3	0.05
Refrigerator	1.3	0.02

* This table is based upon the maximum gas rate and 70 per cent of the maximum gas rate for cookers. The values are the average available data; and more accurate data may be obtained from the individual equipment supplier.

TABLE 2 - Recommended offtakes for tropical climates

LPG cylinder size kg (1)	Offtake- Continuous kg/h (2)	Offtake- Intermittent kg/h (3)
2.4	0.38	0.73
13	0.72	1.44
40	1.15	2.10

4.2.3 *Installation design of cylinders and tanks*

4.2.3.1 General

The cylinder position shall afford ease of access to facilitate changing and quick removal in case of necessity. Cylinders shall be installed in the upright position with valves uppermost so that only vapour is withdrawn in use.

4.2.3.2 Cylinder location (LPG)

4.2.3.2 a) General

LPG cylinders may be used inside residential premises, but cylinders shall not be located in a cellar, basement or sunken area.

Cylinders supplying fixed installations shall be located in a housing with a half hour fire resistance as defined in **BS 476**.

4.2.3.2 b) High rise buildings and flats

LPG cylinders may be used in flats etc. of traditional construction , except for those of five or more storeys (including any basement storeys).

Not more than 15 kg of LPG shall be in use per unit dwelling.

Cylinders shall be located so as not to impede any means of escape.

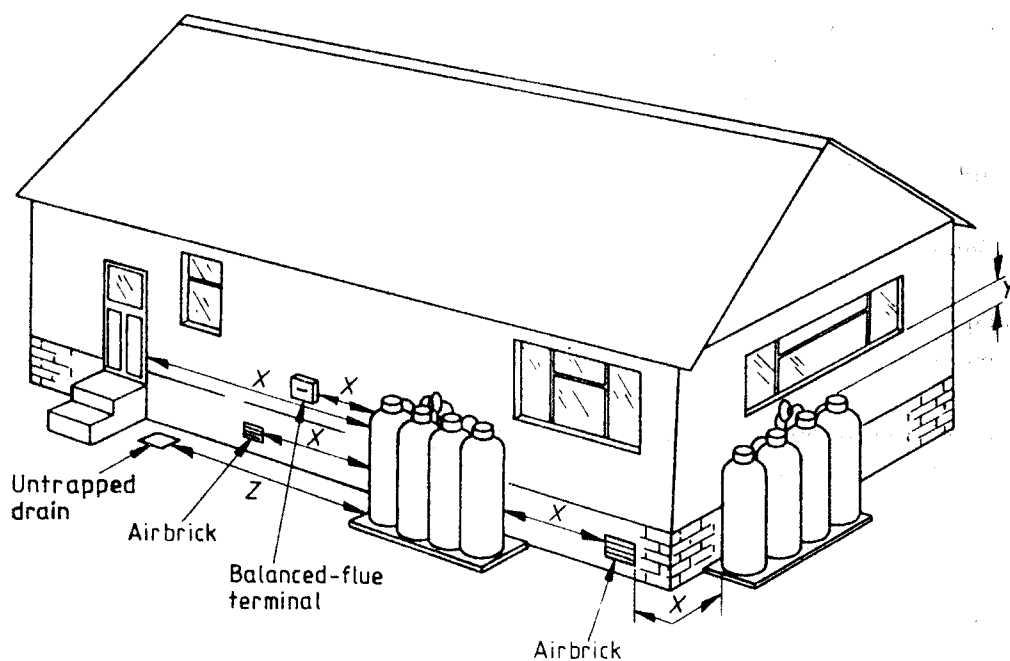
4.2.3.3 Cylinder protection

4.2.3.3 a) Protection

Cylinders fitted outside shall be provided with a firm, clean, dry standing and, in all cases with reasonable protection from accidental damage or interference, e.g. by persons, animals or vehicles (see Figure 1).

4.2.3.3 b) Housing

Where an internal housing is provided for LPG cylinders, the housing shall have a fire resistance not less than 30 minutes as defined in **BS 476**. The housing shall be of adequate size to cover the number of cylinders necessary to serve the installation and allow for easy operation of any valve. It shall also allow access to connections and regulating devices and allow replacement of cylinders with the minimum of disturbance to the installation and ancillary equipment. Adequate vents shall be provided direct to the outside at high and low level, as large as is practicable and each not less than 1/100 of the floor area of the housing.



- X = 1 m minimum
- Y = 300 mm minimum
- Z = 2 m minimum

FIGURE 1 - Cylinder location

4.2.4 High pressure stage design

LPG vapour lines shall not enter a building except under the control of a pressure regulator. For domestic and other residential premises the nominal working pressure shall be 2.8 kPa.

Cylinder valves shall be compatible with the equipment to which they are connected.

Regulators and automatic changeover devices shall conform to **SLS 1180** and shall be located such that the inlet to them is at or above the level of the cylinder outlet valve connection.

Vent holes in regulators shall be carefully oriented or otherwise protected against the possible ingress of water or substances which could cause blockage, and also to allow for drainage.

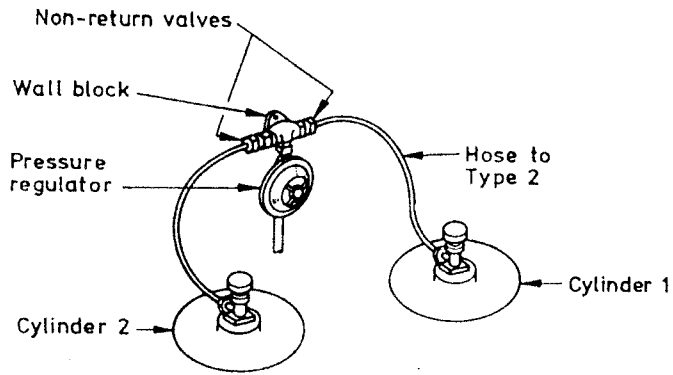
Recommendations on clause 4.2.4

The high pressure stage of installations should preferably be located out of doors. If located inside a housing the pressure regulator should be sited so that the length of the high pressure hose does not exceed 1 m per cylinder. Whenever possible, service and reserve cylinders should be connected to a manifold fitted with non-return valves, which allows one cylinder to be removed for changing without shutting down the whole system. Ideal arrangements are shown in Figure 2.

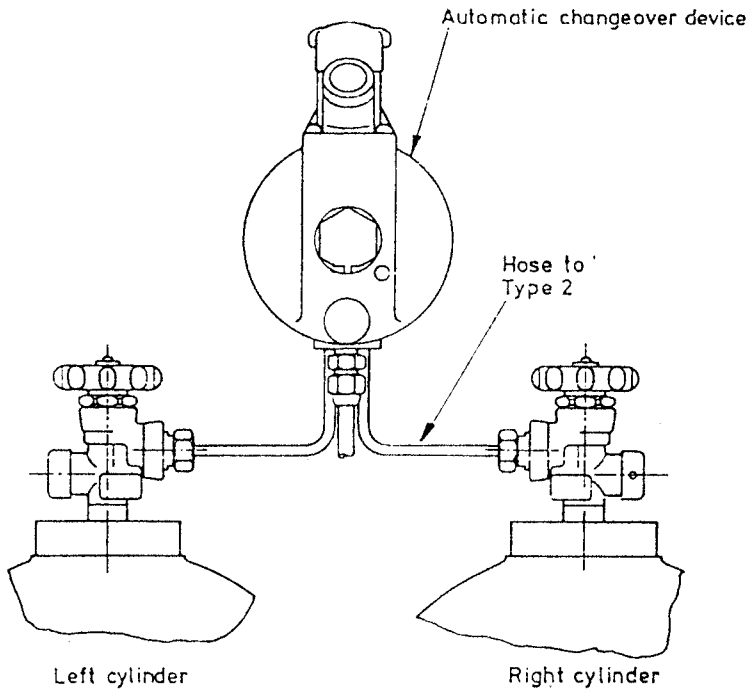
For continuous supply, multiple cylinders may be installed. These may be installed in pairs or in banks of cylinders interconnected via an automatic change-over device which switches gas supply as cylinders go empty.

*Where manifolds are fixed other than directly to the cylinder valve, it is essential that the connecting tube consists of a length of high pressure flexible hose conforming to **SLS 1171** type 2, to allow for movement when cylinders are being changed. Where the manifold or the pressure regulators are fitted directly to the cylinder valve a support should be provided to take their weight when disconnected from the cylinders, for example when cylinders are being changed.*

The appropriate size of pressure regulator should be determined according to the maximum gas rate, calculated according to Table 1.



a) Non-return valves and pressure regulator fitted for manual changeover



b) Non-return valves and pressure regulator incorporated in an automatic changeover device

FIGURE - 2 High pressure stage manifolds

The regulator may be fitted directly to the cylinder valve outlet for single cylinder use, or mounted separately on a manifold for multiple cylinder use.

Multiple cylinder installations should be fitted with an emergency shut-off valve located externally at the point where the supply enters the building. The valve should be clearly identified and its direction of closure indicated.

All pipework should conform to Liquefied Petroleum Gas Association (LPGA) Code of Practice 22 (6).

An intermediate pressure stage system is used where the 1st stage regulator is mounted at, or close to the tank outlet valve and provides an outlet pressure in the order of 100 kPa. The 2nd stage regulator, set at the appliance operating pressure (2.8 kPa for LPG) may be either tank mounted or installed at the dwelling. For cylinder installations the same arrangement applies, however, the 1st stage regulator usually incorporates an automatic change-over device and the 2nd stage regulator is normally either close coupled, or incorporated in the same housing as the 1st stage regulator.

4.2.5 Low pressure stage design

4.2.5.1 Pipe sizes and lengths and estimation of size of gas main

Pipes shall be of such size and length to ensure that there will not be a pressure drop greater than 250 Pa between the outlet of the pressure regulator and any draw-off point when the installation is subjected to the anticipated maximum load.

Recommendations on 4.2.5.1

The size of main is determined by the maximum gas rate of the appliance(s) to be connected (see Table 1).

In general it has been found that for satisfactory operation when the branch length does not exceed 3 m, the sizes of connecting pipes to appliances should be as given in Table 3.

For runs of pipe longer than 3 m, suitable sizes of pipe may be determined using Table 4, Table 5 & Table 6, and may be checked by the method described in Appendix C.

TABLE 3 - Pipe size

Appliance (1)	Size of tube mm (2)	Nominal thickness mm (3)
Cooker (large domestic)	12	0.8
Cooker (small)	10	0.8
Hot plate (2 burner)	6	0.8
Sink storage water heater	8	0.8
Central heating boiler	12	0.8
Refrigerator	6	0.8
Space heater (small)	6	0.8
Lighting appliance	6	0.8

NOTE

Pipes may be designated by their nominal bore or their nominal size. Generally the nominal size of copper pipe is related to the outside diameter of the pipe from which twice the wall thickness will have to be subtracted to obtain the size of the bore. In the case of steel pipe, nominal size is normally related to the bore.

TABLE 4 - BS steel pipe pipe sizing

Length of tubing m (1)	Nominal bore							
	1/4 in		1/2 in		3/4 in		1 in	
	kW (2)	m ³ /h (3)	kW (4)	m ³ /h (5)	kW (6)	m ³ /h (7)	kW (8)	m ³ /h (9)
3	10.6	0.40	88	3.40	176	6.80	386	14.96
6	7.3	0.28	58	2.26	123	4.76	264	10.19
9	6.1	0.23	47	1.81	97	3.74	205	7.93
12	5.1	0.20	41	1.58	82	3.17	176	6.80
15	4.7	0.18	35	1.36	70	2.72	152	5.89
18	4.2	0.16	32	1.22	64	2.49	140	5.44
21	4.0	0.15	30	1.14	60	2.34	129	4.98
24	3.8	0.14	26	1.02	56	2.18	117	4.53

TABLE 5 -Metric copper tube sizing

Length of tubing m (1)	Outside diameter							
	6 mm		10 mm		15 mm		22 mm	
	kW (2)	m ³ /h (3)	kW (4)	m ³ /h (5)	kW (6)	m ³ /h (7)	kW (8)	m ³ /h (9)
3	2.34	0.10	18.08	0.70	30.7	1.19	165.6	6.41
6	1.64	0.07	11.72	0.46	20.9	0.81	108.0	4.17
9	1.41	0.06	9.85	0.38	16.4	0.63	86.4	3.35
12	1.18	0.05	8.67	0.34	14.3	0.56	75.2	2.90
15	0.94	0.04	7.74	0.30	12.4	0.48	65.6	2.56
18	0.94	0.04	7.03	0.28	10.8	0.42	59.2	2.29
21	0.70	0.03	6.57	0.26	10.3	0.40	53.6	2.06
24	0.70	0.03	6.10	0.23	9.6	0.38	48.8	1.90

TABLE 6 - Polyethylene pipe sizing

Length of tubing m (1)	Outside diameter 25 mm		Length of tubing m (4)	Outside diameter 32 mm	
	kW (2)	m ³ /h (3)		kW (5)	m ³ /h (6)
30	46.9	1.78	80	49.4	1.87
40	40.7	1.54	100	43.7	1.66
50	36.5	1.38	120	40.6	1.54
60	33.4	1.26	140	37.7	1.42
70	30.9	1.17	160	35.2	1.34
			180	33.2	1.26
			200	31.4	1.19
			220	29.6	1.12

* These figures are based upon the use of LPG (mixture of commercial butane and propane nominally in the ratio 70:30 by weight) at low pressure of 2.8 kPa and a maximum pressure drop of 250 Pa.

The equivalent lengths of pipe for fittings are as given in Table 7

TABLE 7 - Equivalent lengths of pipe for fittings

Fitting	Equivalent length of pipe m
Elbow or tee	0.6
Connector or 90° bend	0.3
Globe valve (1/2 in)	1.0
Globe valve (3/4 in)	1.4
Gate valve (1/2 in)	0.12
Gate valve (3/4 in)	0.18

4.2.5.2 Flexible hoses

Rigid pipework shall be used wherever possible. However, where flexible hoses are used for movable appliances, e.g. gas rings, Bunsen burners and barbecues, the minimum practical length shall be used.

Flexible hoses shall conform to the relevant measurement of **SLS 1171**. Flexible hoses shall not extend from one room to another, nor pass through any walls, partitions, ceilings, or floors.

Flexible hoses shall be provided with integral threaded metal ends, or secured at each end to a nozzle with a suitable hose clip.

Flexible hoses shall not be used where it may be subjected to a temperature above 50 °C.

Where a flexible connection is used with a domestic cooker, the flexible component shall include metallic protection and comply with the relevant requirements of **SLS 1171**.

Where a flexible hose is connected to fixed pipe work, a shut-off device shall be fitted to the rigid pipework in a readily accessible position immediately prior to the flexible connection.

4.2.5.3 Emergency shut-off valve

The gas inlet point on the installation shall be securely fixed and readily accessible. In the case of cylinders situated in fire resistant housings, the connection shall be situated within the housing.

Bulk tank and multiple cylinder installations shall be fitted with an emergency shut-off valve which is located at a point external to the premises and where gas supply enters the premises.

The valve shall be clearly identified and its direction of closure or opening indicated.

NOTE

For single cylinder installations, the cylinder valve may be considered as the emergency shut off valve.

4.2.5.4 Metered gas supply

Where the gas supply enters the dwelling through a meter, the meter shall be of adequate size to handle the maximum gas load and be suitable for use with LPG at the designed gas pressure.

A pressure relief valve vented to the open air shall be fitted upstream of the meter to protect it from excess pressure. This relief valve may be incorporated in the regulator.

A pressure test point shall be provided in a convenient position on, or as near as possible to, the outlet of the meter.

Recommendations on 4.2.5.4

All necessary information regarding the position and housing of the meter and associated controls should be made available, as early as possible, to those concerned, e.g. fire officers, builders, by means of drawings, specifications and consultations.

4.2.6 Siting of appliances

4.2.6.1 General

Appliances fired by LPG shall not be installed in cellars or basements.

Only room-sealed appliances shall be installed in garages, bathrooms, shower rooms, or any room used for sleeping purposes, such as bedrooms and bed-sitting rooms.

Appliances shall not be sited in a position where the heat therefrom may create a fire hazard or cause damage to surrounding materials.

Appliances shall not be sited in a position where they would cause any obstruction, particularly to passage ways and exits.

4.2.6.2 Siting of cooking appliances

In siting cooking appliances due regard should be paid to convenience in use and to protection from draughts and damage. The appliance should receive adequate light to ensure safe operation.

4.2.6.3 Siting of space heaters

Flueless heaters shall not be sighted in areas designed as sleeping quarters or in unventilated spaces communicating directly with such areas.

4.2.6.4 Siting of refrigerators

Consideration shall be given to the accessibility of the burner for maintenance and lighting, and to its protection from draughts.

A refrigerator shall not be fitted in a larder or similar position with restricted ventilation.

4.2.7 Flues

When the design of the gas appliance requires them, adequate flues of non combustible materials and heat insulated from any combustible part of the dwelling shall be provided. The choice and installation of flues shall be in accordance with the manufacturer's instructions.

4.2.8 Ventilation

4.2.8.1 Ventilation for combustion

Ventilation shall be provided where indicated as necessary. Permanent vents to outside air shall be so designed as to minimize draughts, even in adverse weather conditions. All vents for ventilation shall be protected by a grill.

4.2.8.2 Other ventilation

Adequate ventilation shall be provided in a concealed or confined space in which pipes and joints are situated.

4.3 Installation

4.3.1 Installation of unions, joints, sectional cocks and valves

4.3.1.1 In connection with installation design requirements, reference shall be made to section 4.2, specially in particular to Clauses 4.2.4 to 4.2.8.

4.3.1.2 All unions, cocks and valves shall be readily accessible. Connections for branches from installation pipes shall be made only with pipe fittings.

Where ferrous pipes or pipe fittings with screw threads are used, all threads shall conform to the requirements of **ISO 7-1: 1982**.

Where non ferrous pipes or pipe fittings are used, the joints shall conform to acceptable standards.

4.3.1.3 Where flanged joints, washers or gaskets are used they shall be suitable for use with liquefied petroleum gas. They shall be robust, gas-tight, durable in use and of a type recommended by the LPG industry. Fibber washers and hemp shall not be used.

4.3.1.4 Preference shall be given to screwed, compression or capillary joints. However where joints other than screwed, compression or capillary type are used, brazing, welding and hard soldering (melting point above 450 °C) shall be employed.

4.3.1.5 For screw threads Polytetrafluoroethylene (PTFE) tape used in the manner prescribed by the tape or appliance manufacturer will be acceptable.

4.3.1.6 All joints shall be made in such a manner as to avoid undue stress on the fitting.

4.3.2 *Installation of pipework*

4.3.2.1 General

NOTE

For flexible hose see Clause 4.2.4, for flexible tubing see 4.2.5.2.

All supports and fixing for pipework shall be suitable for their purpose.

Where non-ferrous pipes are laid under floor or otherwise concealed, they shall be routed or positioned to minimize the risk of puncture and similar damage.

4.3.2.2 Pipe fittings

The number of pipe fittings shall be kept to a minimum, and sharp changes of direction shall be avoided. The bore of an installation pipe shall not be restricted either through bending or cutting. While the pipe installation is in progress, care shall be taken to ensure that the bore of a pipe is not restricted by the entry of any foreign material. All open pipe ends shall be temporarily capped or plugged pending extension to completion.

4.3.2.3 Avoidance of corrosion

Installation pipes which pass through, or are in contact with any material likely to cause corrosion shall be protected throughout the area of contact. Pipes which may be exposed to atmospheric corrosion shall be of corrosion resistant material or be suitably protected.

4.3.2.4 Positioning of liquefied petroleum gas pipes relative to other services.

Liquefied petroleum gas installation pipes:

- a) shall not be installed in a ventilation or air-conditioning duct;
- b) shall not be in contact with, or exposed to, leakage from water services;
- c) shall not be exposed to leakage from, and not run adjacent to or in, the same duct as a drainage service;
- d) shall be separated from, and not in the same duct as, electricity or telecommunication services.

4.3.2.5 Pipe support

All pipes shall be suitably anchored to walls or beams by means of clips to give them a firm support and avoid undue strain on pipe joints.

4.3.2.6 Earthing of LPG pipes

LPG pipes shall be cross bonded.

4.3.3 *Installation of pressure regulators*

Pressure regulators shall conform to **SLS 1180** and shall provide a final outlet pressure of 2.8 kPa for LPG.

The appropriate size of all regulators shall be determined according to the maximum gas rate calculated using Table 1.

Where regulators are fitted with integral relief valves, they shall be vented to the open air away from any source of ignition.

4.3.4 *Installation of appliances*

4.3.4.1 General

Appliances shall be connected in such a manner as to eliminate undue stress on the pipework or fittings.

The installer shall provide the user with all the relevant manufacturer's instructions.

4.3.4.2 Avoidance of fire risk

The surfaces of adjacent structures in contact with the appliance shall be of material that will withstand temperatures of 65 °C.

Recommendations on 4.3.4.2

Where combustible material adjacent to an appliance might otherwise have a temperature rise in excess of 50 °C, it is essential that provision be made to protect such material. such protection may be afforded by mounting a sheet of durable non-combustible material between the appliance and the combustible material so as to provide a ventilated air space of not less than 25 mm between the sheet and the combustible material.

In certain cases similar considerations will apply to surfaces immediately above the appliances, when the same precautions should be taken.

4.3.4.3 Installation of individual appliances

The installation of individual appliances shall be in accordance with the relevant Sri Lanka Standards when available or, the appliance manufacturer's instructions where such instructions are available. In all other instances they shall be installed in accordance with other relevant reputed national standards.

5 INSPECTION TESTING AND USER INSTRUCTIONS

5.1 Inspection and testing of new installations

The complete system comprising the high pressure stage, low pressure stage and an intermediate pressure stage when used shall be tested by the installer using the methods described in Appendix A and Appendix B.

NOTE

When purging the system of air, precautions should be taken to avoid hazardous accumulations of gas.

The adjustment of appliances shall be in accordance with the manufacturer's instructions.

- a) *High pressure stage.* The valves and high pressure connections shall be tested for leaks in accordance with Appendix **B**.
- b) *Intermediate pressure stage.* The intermediate pressure stage shall be tested with gas or air to twice the normal intermediate working pressure. Before carrying out this test the outlet of the low pressure regulator shall be closed.
- c) *Low pressure stage.* The system shall be tested in accordance with the method specified in either **A.2.2** or **A.2.3**.

NOTE

The test(s) may take the form of one only on the complete installation; alternatively the installation pipes may be tested separately first.

5.2 User instructions

The installing organization shall supply the consumer with printed instructions as to the correct and safe handling of the system, its appliances and emergency procedures. In particular, attention should be drawn to the changing of cylinders and the risks involved, and action to be taken to disperse accidental accumulation of gas.

An example of an emergency action notice or leaflet is given in Appendix **D**.

APPENDIX A
(informative)
Testing of low pressure stage of installation

A.1 General

Two tests are included in this Appendix:

- a) the installation before the appliances are connected; and
- b) the complete installation.

A.2 Testing the installation before the appliances are connected

A.2.1 Preparation

Use air as the test medium. Cap or plug all open points in the system except for one which is used to admit air and attach the 'U' gauge (see Figure 3) or the bubble leak indicator (see Figure 4).

A.2.2 'U' gauge method

At the open point, screw on the test apparatus consisting of a brass tee tube with two taps and tube nozzles as shown in Figure 3.

Attach the 'U' gauge to one of the tube nozzles by means of a rubber connection, and a bicycle pump or other suitable instrument to the other tube nozzle through a non return valve.

- a) Turn on taps A and B.
- b) Inject air into the system until the 'U' gauge registers 4.5 kPa.
- c) Turn off tap A.
- d) Leave for 5 min to allow the temperature in the system to equalize.
- e) Note the 'U' gauge reading.
- f) Turn off tap B.
- g) Leave for 5 min.
- h) Turn on tap B and note pressure on 'U' gauge; the reading should be the same as in A.2.2.e).

If the pressure reading has fallen, examine the whole of the installation to locate the source of leakage. The method usually adopted is to restore the pressure in the system and check each joint by applying soapy water until the leaking joint is discovered. Any defective joints or fittings should be remade or replaced and the procedure under a) to h) repeated, until the installation is sound.

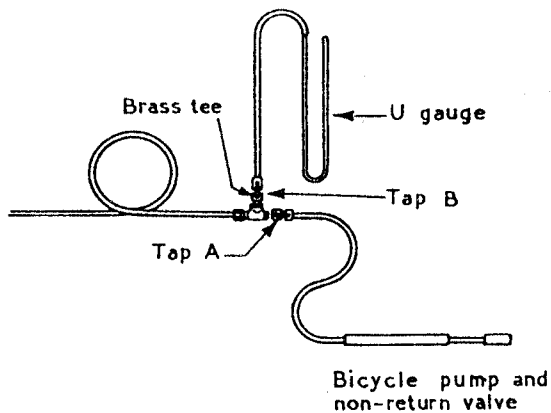
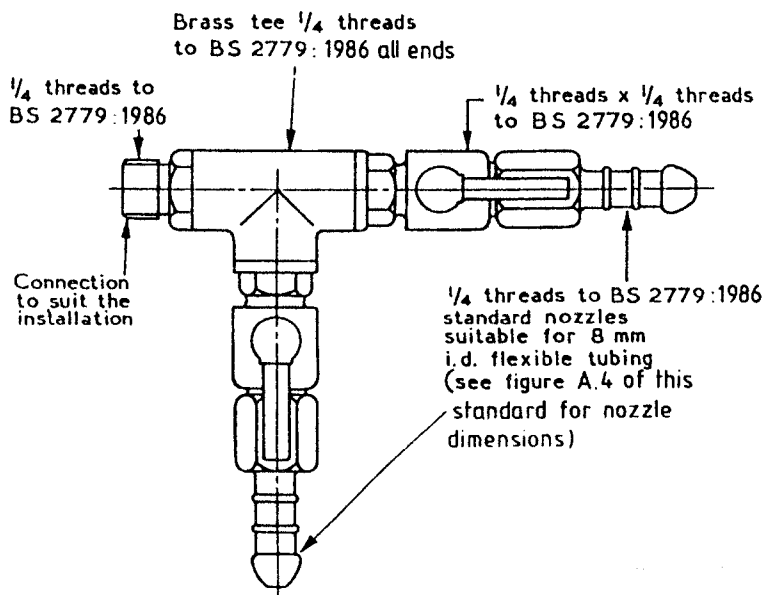


FIGURE 3 - Installation test apparatus

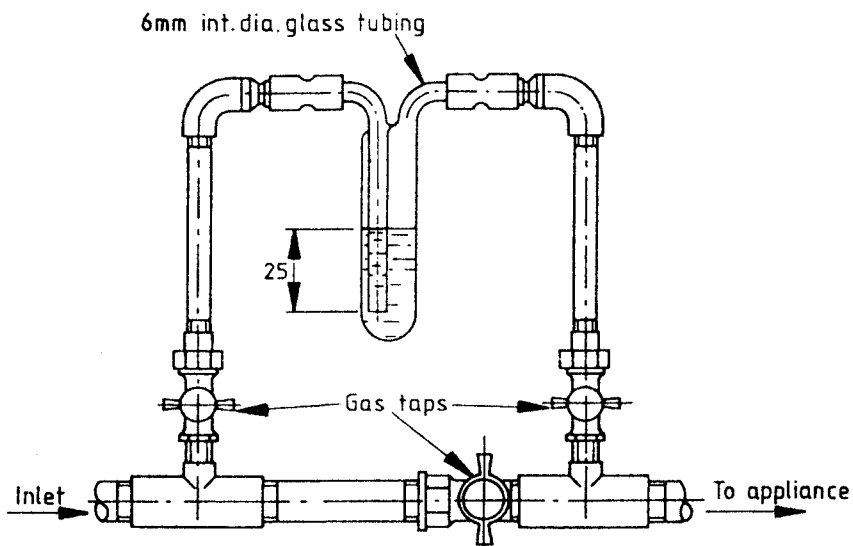


FIGURE 4 - Bubble leak indicator

A.2.3 Bubble leak indicator method

Connect the indicator illustrated in Figure 4 to the installation. Supply air maintained at an appropriate constant pressure to the installation initially through the main tap on the indicator. When the installation is fully charged, open the taps to and from the glass tubes of the indicator. Shut the main tap. Count the rate of bubbles emerging in the indicator.

The installation is considered to be sound if the leakage rate does not exceed $85 \text{ cm}^3/\text{h}$ over a period of 1 min. A rate of 6 bubbles/min through the indicator would be equivalent to $85 \text{ cm}^3/\text{h}$, but this should be checked before the indicator is used.

A.3 Testing of complete installation.

After the above test has proved the installation sound, connect the appliances and the gas supply. Proceed as follows (see Figure 3 and Figure 5):

- a) Make sure all appliance taps are closed;
- b) Turn on the gas supply;
- c) Turn on a tap on each appliance in turn and purge the installation of air, taking care to keep a light near enough to the issuing gas/air stream to ignite when the mixture becomes rich enough. Close each tap in turn;
- d) Ascertain that the pressure regulator is operating at the design pressure of the appliances by opening tap B. Close tap B;
- e) Isolate the gas supply, open an appliance tap until a pressure drop of approximately 50 Pa is observed and the immediately close the tap;
- f) Allow 5 min for temperature equalization;
- g) Note 'U' gauge reading;
- h) Turn off tap B;
- j) Wait 5 min, turn on tap B and note 'U' gauge reading. If this 'U' gauge reading is lower than that shown in g) there is a leakage in the installation, and the appliance(s) connections, taps, etc. should be carefully examined using soapy water or other leak detection method.; and
- k) Carry out a visual inspection of all joints to ensure that they have been correctly made.

NOTE

When testing an existing complete installation, the test in A.2 is omitted. If there is no pressure point fitted in the system the 'U' gauge may be conveniently attached to any of the injectors on an appliance by removing the jet and fitting the pressure test point adapter and washer shown in Figure 6.

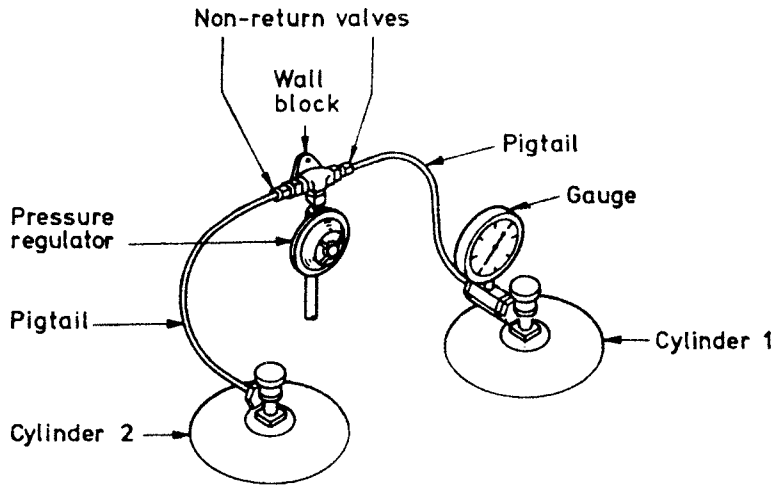
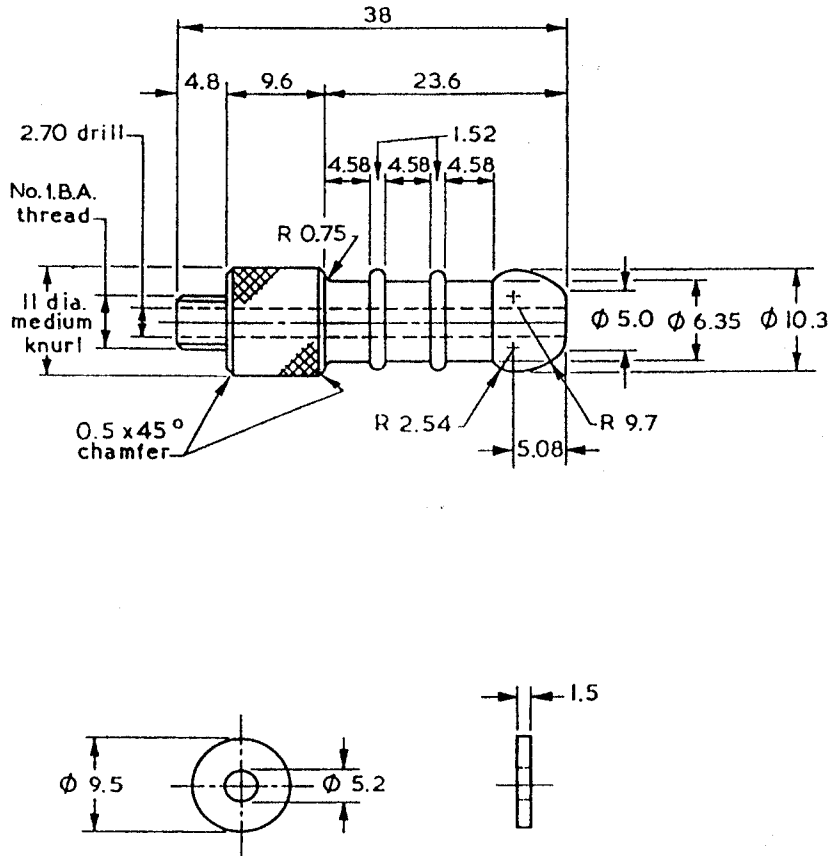


FIGURE 5 - High pressure leakage test



Linear dimensions in millimetres

FIGURE 6 - Standard nozzle pressure point adaptor and washer for 8 mm (5/16 in) int.dia. flexible tubing

APPENDIX B
(Normative)
Testing of high pressure stage of installation

B.1 Cylinder installations

The following procedure shall be adopted for cylinder installations (see Figure 5):

- a) Close off low pressure line at the emergency isolation valve; and
- b) Break pigtail joint at cylinder 1 and couple gauge between pigtail and cylinder valve.

NOTE

A suitable pressure gauge would have a range from 0 to 1 MPa, and a dial not less than 100 mm in diameter.

- c) Close off cylinder valve 2 and open cylinder valve 1 to charge system with gas.
- d) Close cylinder valve 1 and allow to stand for 5 min for equalization of temperature.
- e) Note pressure on gauge.
- f) If pressure drops, test individual joints with soapy water or other soap detection method.

For an installation using non-return valves the foregoing procedure shall be carried out on both cylinders.

B.2 Bulk installations

Where any pipework is subjected to full tank pressure, it shall be tested by the method described in **B.1**. Where the first stage regulator is fitted directly to the tank valve, the connection should be tested for leakage by means of soapy water or other leak detection method.

APPENDIX C
(normative)

Testing of low pressure stage of installation for pressure loss

Following a satisfactory test carried out in accordance with **A.3** and with the manometer still connected to the system, proceed as follows:

- a) Turn on the gas supply and light a small burner such as a hot plate burner, preferably remote from the gas supply position and then note the nominal operating pressure indicated on the manometer;

- b) Light all burners to provide the maximum anticipated load and then note the pressure drop at the manometer;
- c) At the maximum anticipated load the pressure drop shall comply with **4.2.5.1**;
- d) Adjust the regulator to give the nominal operating pressure of 2.8 kPa; and
- e) Turn off all burners and check that the lock-up pressure after 60 s does not exceed the nominal operating pressure by more than 1 kPa and that it does not continue to rise.

APPENDIX D (Informative)

Model emergency action notice or leaflet for users of liquefied petroleum gas

The following is an example of an emergency action notice.

NOTE

It is recommended that capital letters should be used where indicated and that the colour red should be used for words and phrases marked with an asterisk to reinforce the importance of these words.

Emergency action procedures

In the event of **GAS LEAKAGE***

- NEVER operate electrical switches
- NEVER look for a leak with a naked flame
- NEVER enter basements

CALL the gas supplier and consider calling the fire brigade. Wait outside.

If safe to do so

- Extinguish all naked flames
- Turn off gas supply at cylinders
- Open doors and windows fully to ventilate the area

DO NOT turn on the gas supply until it has been made safe to do so by a competent person.

In the event of **FIRE***

- Alert everyone in the area.
- Call the fire brigade immediately and inform them that LPG cylinders are on the premises.
- Turn off gas supply at cylinders, if practical and safe to do so.
- Do not go near cylinder(s), in the vicinity of the fire.
- **DO NOT** turn on the gas supply until it has been made safe to do so by a competent person.

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