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Code of practice for

**Domestic butane - and propane -
gas-burning installations**

Part 1. Installations in permanent dwellings

[formerly CP 338 and CP 339 : Part 1]

Code de bonne pratique pour les installations domestiques
aux gaz butane et propane
Partie 1. Installations dans les habitations permanentes

Richtlinien für Butan- und Propangas verbrennende Haushaltsanlagen
Teil 1. Anlagen in Wohnhäusern

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Foreword

This British Standard Code of practice, which will be published in three Parts, is a revision of CP 338 : 1957 and CP 339 : Part 1 : 1956 and in its preparation the opportunity has been taken to incorporate propane gas requirements and to express values in SI units. In line with the policy to bring codes of practice into the numbering series for British Standards, this code is being published under the number BS 5482.

This code of practice represents a standard of good practice but compliance with it does not confer immunity from relevant legal requirements, regulations and bye laws. In particular attention is drawn to the Gas Safety (Installation and Use) Regulations 1984, the Building Regulations of England and Wales, of Scotland and of Inner London, and the Home Office Fire Prevention Guide no. 4 on the safe use and storage of liquefied petroleum gas in residential premises. This guide specifies the limitations on the use of liquefied petroleum gas for specific types of premises, particularly flats and multiple occupation premises.

British Standard Code of practice for

Domestic butane - and propane - gas-burning installations

Part 1. Installations in permanent dwellings

[formerly CP 338 and CP 339 : Part 1]

Section one. General

1. Scope

This code of practice deals with the installation in permanent dwellings of domestic systems using liquefied petroleum gases whether from cylinders or bulk supply at a pressure of 28 mbar* for commercial butane and at 37 mbar for commercial propane. It gives guidance on the selection of materials, components and appliances, on design considerations, on installation requirements, on inspection and testing and on consumer instruction.

Appendix A contains basic user guidance on safe practice for inclusion in the instructions.

This standard does not cover the installation on site of bulk supplies of LPG, for which guidance is given in Health and Safety Executive Guidance Note HS (G) 34.

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

2. References

The titles of the standards publications referred to in this code are listed on the inside back cover.

3. Definitions

For the purposes of this Part of this code, the following definitions apply, together with the relevant terms in BS 1179 and BS 5264.

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). This term as used in this code means and includes commercial butane and commercial propane as defined in BS 4250. (See A.1 for some general properties.)

3.3 high pressure stage. That part of the installation between the valve of the cylinder and the inlet of the pressure 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.

NOTE. This system is used for propane bulk installations in which the tank is some distance from the point of usage; it can also apply to propane cylinder installations in similar circumstances and when the gas demand is heavy. The first stage regulator at the tank or cylinder position is set to deliver gas at a pressure within the range

of 70 mbar to 300 mbar to a secondary regulator set at the appliance operating pressure, installed externally at the point of entry to the dwelling.

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. A portable and refillable vessel of approved design containing liquefied petroleum gas under pressure.

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

3.8 low pressure regulator. An apparatus for automatically maintaining a constant gas outlet pressure at the level recommended for the appliances in use.

3.9 gas meter. An apparatus for measuring the volume of liquefied petroleum gas in vapour form at low pressure; meters can be either of a 'credit' or 'prepayment' type. The latter incorporates means by which a pre-set volume of gas is delivered on insertion of a coin or token.

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

3.11 atmosphere sensitive cut-off valve. An 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.

3.12 safety valve. An automatic valve incorporated to protect a cylinder or system against excessive pressure. It will vent to atmosphere when a predetermined maximum pressure is attained.

3.13 diffusive catalytic space heater. An appliance in which neat gas diffuses through a catalytic bed and is flamelessly oxidized by oxygen which has diffused into the bed from the surrounding atmosphere at a temperature below that at which combustion would occur in the absence of the catalyst.

This definition does not include catalytic heaters in which complete premixing of gas and air is effected before the catalytic bed is reached, nor does it include appliances employing after-burners in which products of incomplete combustion from normal flames are further oxidized over a catalyst.

3.14 low bed-temperature cut-off device. A device that cuts off the gas supply to an appliance when the catalytic bed ceases to operate satisfactorily.

* 1 mbar = 10² N/m² = 100 Pa.

Section two. Materials, components and appliances

4. Materials

4.1 Pipework materials

4.1.1 Recommended. The following materials are recommended for general use for installation pipework:

- (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.

NOTE 1. Brass tubes that comply with the requirements of BS 2871 : Part 2 (designation CA 126 and CZ 110) which have been given a final drawing operation after annealing are considered suitable.

NOTE 2. Plastics pipes and fittings should not be used inside the dwelling.

NOTE 3. Malleable cast iron fittings are suitable only for intermediate and low pressure stage installations.

4.1.2 Not recommended. The following materials are *not* recommended for general use for installation pipework for the reasons shown:

- (a) Aluminium (corrosion)
- (b) Composition and lead (creep)
- (c) Brass tubing (subject to season cracking)

NOTE. Tubing of the type fabricated from sheet steel, coated internally and externally and wrapped should not be used externally because it is subject to atmospheric corrosion.

4.2 Selected materials. The materials used should comply with the requirements of the relevant British Standards, e.g.

- BS 21 Pipe threads for tubes and fittings where pressure-tight joints are made on the threads
- BS 143 Malleable cast iron and cast copper alloy
- & 1256 screwed pipe fittings for steam, air, water, gas and oil
- BS 864 Capillary and compression tube fittings of copper and copper alloy
- Part 2 Specification for capillary and compression fittings for copper tubes.
- BS 1387 Steel tubes and tubulars suitable for screwing to BS 21 pipe threads
- BS 1494 Fixing accessories for building purposes
- BS 1740 Wrought steel pipe fittings (screwed BSP thread)
- Part 1 Metric units.
- BS 2871 Copper and copper alloys, tubes
- Part 1 Copper tubes for water, gas and sanitation
- Part 2 Tubes for general purposes
- 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 3601 Specification for steel pipes and tubes for pressure purposes: carbon steel with specified room temperature properties.

- BS 3605 Seamless and welded austenitic stainless steel pipes and tubes for pressure purposes
- BS 4368 Carbon and stainless steel compression couplings for tubes
- Part 1 Specification for heavy series couplings (metric)
- Part 3 Compression couplings for tubes
- BS 5292 Specification for jointing materials and compounds for installations using water, low pressure steam or 1st, 2nd and family gases.

NOTE. Gas cock lubricants should be suitable for use with liquefied petroleum gas, e.g. those having a 25 % molybdenum disulphide base.

5. Components

Components should comply with the requirements of the relevant British Standards, e.g.

- BS 1552 Specification for control plug cocks for low pressure gases.
- BS 3016 Specification for pressure regulators and automatic change-over devices for liquefied petroleum gases
- BS 5045 Transportable gas containers
- Part 2 Steel containers up to 130 litres water capacity with welded seams.

Where no British Standard exists, components should be of standard types recommended by manufacturers or wholesale gas distributors.

A tapered plug cock should 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 should be either of the drop fan or loose key type or so positioned to prevent inadvertent operation.

Valves may be of ball or diaphragm type, but it is essential that they be suitable for liquefied petroleum gas.

Needle valves and gate valves are not considered to be suitable for use as isolating valves.

6. Selection of appliances

6.1 General. Domestic appliances should comply with the requirements of the relevant British Standards, in particular BS 5258.

6.2 Selection of cooking appliances. Cooking appliances should comply with the requirements of:

B.S. 5258 Safety of domestic gas appliances

- BS 5314 Specification for gas heated catering equipment
- BS 5386 Specification for gas burning appliances
- Part 3 Domestic cooking appliances burning gas
- Part 4 Built-in domestic cooking appliances

6.3 Selection of fixed space heaters. In selecting fixed space heaters, each of the following points should be taken into consideration.

(a) Space heaters should comply with the requirements of BS 5258 : Parts 5, 10, 11 or 13.

(b) The mode of heat dissipation and physical size of the appliance should be suited to the application and siting. Preference should be given to flued heaters.

6.4 Selection of water heaters. In selecting water heaters, each of the following points should be taken into consideration.

- (a) Water heaters should also comply with the appropriate requirements of BS 5258 : Part 7 and BS 5386 : Parts 1 and 2.
- (b) In general, a water heater that serves only a sink or wash basin does not require a flue; any other water heater should be connected to a flue. However, an instantaneous sink water heater should be flued if fitted in a confined space. (See 12.5 on the use of water heaters with showers.)
- (c) Preference should always be given to the use of room-sealed appliances; this is essential when they are installed in bathrooms.
- (d) A water heater should be selected only if it is fitted with a flame-failure device, arranged to shut off the main and pilot (where fitted) gas supplies in the event of flame failure. (See BS 5386 : Part 1.)

6.5 Selection of central heating systems. In selecting central heating systems, each of the following points should be taken into consideration.

6.5.1 Water filled systems. As an alternative to individual appliances providing separate heating and hot water services, consideration may be given to the installation of wet type central heating and/or hot water systems which should comply with BS 5258 : Part 1 and BS 6798 as appropriate.

6.5.2 Ducted warm air systems. A ducted warm air system that complies with the requirements of BS 5258 : Part 4 and is installed in accordance with the recommendations of BS 5864.

6.6 Selection of refrigerators. Refrigerators should comply with the requirements of BS 5258 : Part 6. The following three main types are available:

- (a) free-standing
- (b) wall-mounting
- (c) built-in

Refrigerators of type (c) can have either integral inlet and outlet ventilating louvres or inlet and outlet louvres positioned remote from the refrigerator, provided there is adequate provision for air circulation (see 18.3).

6.7 Selection of lighting appliances. Lighting appliances should comply with the requirements of BS 2977.

Section three. Installation design

7. Basic layout of supply system

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

8. Cylinder requirement design considerations

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

In choosing the type of cylinder consideration should be given to the likely usage and the time that the cylinder contents will last. For severe winter conditions additional cylinders would be required.

The number of cylinders required can be calculated by totalling the gas rate for each appliance in kg/h and dividing this total by the recommended offtake for the size of cylinder chosen.

9. Installation design considerations

9.1 Cylinders

9.1.1 General. All LPG cylinders should preferably be stored outside dwellings. The cylinder position should afford ease of access to facilitate changing and quick removal in case of necessity. The requirements of the Health and Safety Executive Guidance Note CS4, 'The keeping of liquefied petroleum gas in cylinders and similar containers', should be complied with.

It is essential that each cylinder be stored and used upright with the valve uppermost.

It is imperative that cylinders be installed at or above ground level, never below ground level, in sunken areas or adjacent to open drains or basement access areas where gas might collect.

It is essential to avoid the following positions for the cylinder:

- (a) any position that is subject to extremes of temperature (see clause 10);
- (b) in proximity to corrosive or readily combustible substances;

(c) in the proximity of possible sources of ignition in the event of accidental discharge of gas;

(d) immediately adjacent to a flue terminal or ventilation opening.

9.1.2 Propane cylinders are required to be fitted outside.

9.1.3 Butane cylinders may be fitted inside domestic premises provided they are fitted in accordance with **9.2.2**.

9.2 Cylinder protection and housing

9.2.1 Protection. Cylinders fitted outside should be provided with firm, clean, dry standing and, in all cases, with reasonable protection from accidental damage or interference, e.g. by persons, animals, vehicles, etc.

9.2.2 Housing. Where an internal housing is provided for butane cylinders, it is essential that the housing should have a fire resistance of not less than 30 min as defined in BS 476 : Part 8 : 1972. The housing should be of adequate size to cover the number of cylinders necessary to serve the installation and allow for easy operation of any valve. It should also allow access to connections and regulating devices and permit replacement of cylinders with a minimum of disturbance to the installation and ancillary equipment. Adequate vents should be provided direct to outside at high and low level, each as large as is practicable and not less than 1/100 of the floor area of the enclosure.

9.3 Bulk tank location. Where a bulk tank is fitted to supply one or more dwellings it is essential that the requirements of the Health and Safety Executive Guidance Note HS (G) 34 be complied with.

10. High pressure stage design considerations

The high pressure stage of installations should be located preferably out of doors (but see **9.1.3**). If located inside a housing the pressure regulator should be so sited that the length of the high pressure stage 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 will permit one cylinder to be removed for changing without shutting down the whole system. Ideal arrangements are shown in figure 1.

NOTE. Health and Safety Executive recommendations indicate that under no circumstances should be temperature of the cylinder exceed 45 °C. For butane cylinders, satisfactory service may not be obtained below 10 °C; the most suitable temperature range is from 13 °C to 30 °C. For temperatures below 13 °C, the use of propane should be considered.

Where manifolds are fixed other than directly to the cylinder valve, it is essential that the connecting tube should consist of a length of high pressure flexible hose complying with the requirements of BS 3212 (type 2 with integral threaded metallic ends), to allow for movement when cylinders are being changed. Where the manifold or pressure regulators are fitted directly to the cylinder valve, provision should be made as in clause **15**.

A support should be provided to take the weight of the pressure regulator when it is 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 using table 1.

11. Low pressure stage design considerations

11.1 Pipe sizes and lengths. The size of main is determined by the maximum gas rates 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 specified in the following table.

Appliance	Size of tube	Nominal thickness
	mm	mm
Cooker, large	12	0.8
Cooker, small	10	0.8
Hotplate, 2-burner	6	0.8
Lighting appliance	6	0.8
Sink storage water heater	8	0.8
Sink instantaneous water heater	12	0.8
Multipoint water heater	15	1.0
Refrigerator	6	0.8
Central heating boiler	12	0.8
Space heater, small	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*. (See table Y of BS 2871 : Part 1 : 1971.) In the case of steel pipe nominal size is normally related to the bore.

For runs of pipe longer than 3 m, suitable sizes of pipe can be determined by using figure 2. Recommended practice permits a 2.5 mbar pressure drop between the outlet of the pressure regulator and any draw-off point when the installation is subjected to the anticipated maximum load. This may be checked by the method outlined in appendix D.

The equivalent lengths of pipe for fittings are as follows:

Elbow or tee	0.6 m
Connector or 90° bend	0.3 m
Globe valve ½ in	1.0 m
Globe valve ¾ in	1.4 m
Gate valve ½ in	0.12 m
Gate valve ¾ in	0.18 m

11.2 Estimation of size of main. To determine rapidly the bore of the main required add the squares of the sizes of all branch connections and take the square root of this total, e.g. if an installation consists of an average size cooker, boiler, refrigerator and a small space heater, the size of main would be calculated as follows:

Appliance	Size of branch pipe (a)	a ²
	mm	
Cooker	10	100
Boiler	12	144
Refrigerator	6	36
Space heater, small	6	36

Total 316

Diameter of main = $\sqrt{316} = 17.78$ approximately.

Hence the size of main would be 18 mm.

Table 1. Appliance rates, number of cylinders and cylinder offtakes* (see clauses 8, 10 and 11)

Appliance	Gas rate range				Number of cylinders required			
	Butane		Propane		Butane		Propane	
	m ³ /h	kg/h	m ³ /h	kg/h	13 to 15 kg	13 kg	19 kg	47 kg
Cooker (large domestic)	0.57 to 0.71	1.39 to 1.74	0.74 to 0.93	1.37 to 1.74	1.75	1.15	0.88	0.49
Cooker (normal domestic)	0.34 to 0.42	0.83 to 1.04	0.42 to 0.57	0.79 to 1.05	1.05	0.70	0.56	0.31
Hotplate (2 burner)	0.11 to 0.14	0.28 to 0.35	0.14 to 0.20	0.26 to 0.37	0.50	0.35	0.28	0.15
Hotplate (3 burner)	0.14 to 0.20	0.35 to 0.49	0.20 to 0.25	0.37 to 0.47	0.70	0.45	0.36	0.20
Hotplate (2 burner and grill)	0.20 to 0.23	0.49 to 0.56	0.25 to 0.28	0.47 to 0.53	0.80	0.50	0.40	0.22
Space heater, large	0.14 to 0.23	0.35 to 0.56	0.20 to 0.28	0.37 to 0.53	0.80	0.50	0.40	0.22
Boilers and air heater	0.42 to 0.57	1.00 to 1.41	0.54 to 0.71	1.00 to 1.35	2.02	1.28	1.02	0.57
Space heater, small	0.04 to 0.06	0.10 to 0.14	0.06 to 0.08	0.11 to 0.16	0.20	0.15	0.12	0.07
Lighting appliance	0.007 to 0.02	0.0017 to 0.049	0.009 to 0.03	0.016 to 0.047	0.07	0.04	0.03	0.02
Sink storage water heater	0.06 to 0.08	0.14 to 0.21	0.08 to 0.11	0.16 to 0.21	0.30	0.20	0.16	0.09
Sink instantaneous water heater	0.31 to 0.37	0.77 to 0.90	0.40 to 0.48	0.71 to 0.90	1.30	0.85	0.68	0.38
Multipoint instantaneous water heater	0.68 to 0.91	1.67 to 2.23	0.88 to 1.19	1.64 to 2.22	3.20	2.10	1.68	0.93
Refrigerator	0.006 to 0.008	0.014 to 0.021	0.008 to 0.011	0.016 to 0.021	0.03	0.02	0.02	0.002
Iron	0.04 to 0.06	0.10 to 0.14	0.06 to 0.08	0.11 to 0.16	0.20	0.15	0.12	0.07

The recommended offtakes for temperate climate are: Butane

Cylinder size	Offtake
13/15 kg	0.696 kg/h

Propane

Cylinder size	Offtake
13 kg	1.054 kg/h
19 kg	1.319 kg/h
47 kg	2.373 kg/h

*This table is based upon the maximum gas rates and a 70 % diversity factor for cookers.

11.3 Flexible tubing. Where flexible tubing is used, it should comply with the requirements for type 1 of BS 3212, and be of the minimum practicable length but not more than 2 m. It should not extend from one room to another nor pass through any walls, partitions, ceilings or floors. Flexible tubing should be readily accessible for inspection at regular intervals. For interior use the flexible tubing should be provided with integral threaded metallic ends or secured to a nozzle by crimping or the use of a suitable hose clip. Flexible tubing should not be used where it may be subjected to temperatures above 50 °C. Where flexible tubing is used a shut-off device should be fitted to the rigid pipework, in a readily accessible position immediately prior to the flexible connection.

11.4 Inlet connection. The inlet gas connection on the installation piping should be securely fixed and readily accessible. In the case of cylinders in fire resisting housings this connection should be situated within the housing.

11.5 Metered gas supply. Where the gas supply enters the dwelling through a meter, the meter should be of adequate size to handle the maximum gas load and be suitable for use with liquefied petroleum gas at the designed gas pressure.

The installation of the meter should follow be in accordance with BS 6400 where applicable.

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, i.e.

fire officers, builders, etc., by means of drawings, specifications and consultations.

It is essential that a pressure relief valve vented to the open air be fitted upstream of the meter to protect it from excess pressure. This relief valve may be incorporated in the regulator and, if so, it is essential that the regulator be also vented to the open air.

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

Where prepayment meters are fitted it is advisable to fit a manually reset low pressure cut-out valve on the inlet of all appliances that are not fitted with a flame failure valve.

12. Siting of appliances

12.1 General. Appliances should not be sited in a position where the heat therefrom may create a fire hazard or cause damage to surrounding materials. (See 18.1.1, 18.1.2, 18.2.1, 18.2.2 and 18.2.3.)

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

12.2 Siting of cooking appliances. In siting cookers due regard should be paid to convenience in use and to protection from draughts and damage. It is desirable that the appliance should receive adequate light to ensure safe operation.