

AS/NZS 2658:2022



STANDARDS
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Australian/New Zealand Standard™

LP Gas — Portable and mobile appliances



AS/NZS 2658:2022

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- Department of Mines, Industry Regulation and Safety — Building and Energy WA
- Energy Networks Australia
- Gas Appliance Manufacturers Association of Australia
- Gas Association of New Zealand
- Gas Energy Australia
- Gas Technical Regulators Committee
- Gas Utilisation Institute, New Zealand
- Joint Accreditation System of Australia and New Zealand
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Australian/New Zealand Standard™

LP Gas — Portable and mobile appliances

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Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee AG-001, Gas appliances to supersede AS 2658—2008, *LP Gas—Portable and mobile appliances*.

The objective of this document is to provide uniform minimum requirements for the safe design and performance of LP Gas portable and mobile appliances supplied with gas at vapour pressure.

This document should not be regarded as a design specification or as an instruction manual.

In its preparation, consideration has been given to —

- (a) continuity of satisfactory operation of appliances and equipment;
- (b) the prevention of fire hazards, and explosions;
- (c) the prevention of injury to persons or property;
- (d) gas rules and regulations now in force; and
- (e) relevant International Standards.

The major changes in this edition are as follows:

- (i) A general alignment of general structure with AS/NZS 5263.0.
- (ii) A clarification of the scope and requirements to ensure appliances under this document are not to be installed.
- (iii) Requirements for butane cookers modified to address risks of overheating of cartridges.
- (iv) Requirements for heaters included to address risks related to use in tents and enclosed spaces.
- (v) Requirements for water heaters updated to clarify usage.

The terms “normative” and “informative” are used in Standards to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

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NOTES

Australian/New Zealand Standard

LP Gas — Portable and mobile appliances

Section 1 Scope and general

1.1 Scope and application

1.1.1 Scope

This document specifies the general requirements and test methods for portable and mobile appliances which use vaporized LP Gas as a fuel. The gas pressure at the injector orifice may be regulated or at vapour pressure.

This document applies where LP Gas is supplied to the appliance —

- (a) from a separate non-refillable gas container, conforming to EN 417, UL 147A/B, DOT 39 LP (up to 2 L water capacity) or equivalent, at the vapour pressure to the inlet of the appliance;
- (b) from a separate gas container, conforming to AS 2030.1 (or equivalent), connected directly or by flexible hose assembly; or
- (c) from an integral gas supply with gas storage in excess of 50 mL water capacity.

Additional specific requirements are specified for the following appliances types:

- (i) Cooking appliances (hotplates, ovens, grills, barbecues).
- (ii) Small radiant heating appliances (heaters) designed for outdoor use.
- (iii) Gas lights designed for outdoor use.
- (iv) Portable water heaters designed for outdoor use.
- (v) Hand-held heating tools.

This document excludes the following:

- (A) Appliances intended for connections to a flue for the discharge of combustion products.
- (B) Appliances intended for connection to fixed piping systems for gas and/or water supply.
- (C) Appliances having an integral gas supply of 50 mL or less water capacity.
NOTE 1 These appliances are subject to statutory requirements.
- (D) Gas refrigerators.
- (E) Appliances intended for connections to mains electrical supply.
- (F) Appliances incorporating an enclosed cartridge and are intended for commercial use.
- (G) Appliances using fan assisted combustion systems.

NOTE 2 Requirements for storage and handling of LP Gas indoors and outdoors are specified in AS/NZS 1596.

NOTE 3 Requirements for gas cylinders are specified in AS 2030 (series).

NOTE 4 Requirements for installed cooking appliances designed to operate with regulated inlet pressure are specified in AS/NZS 5263.1.1.

NOTE 5 Requirements for installed water heaters designed to operate with regulated inlet pressure are specified in AS/NZS 5263.1.2.

NOTE 6 Requirements for installed space heaters designed to operate with regulated inlet pressure are specified in AS/NZS 5263.1.3.

NOTE 7 Requirements for gas refrigerators are specified in AS/NZS 5263.1.5.

NOTE 8 Requirements for outdoor cooking appliances not within the scope of this document that are designed to operate with regulated inlet pressure are specified in AS/NZS 5263.1.7.

NOTE 9 Statutory and regulatory requirements may be applicable to the product(s) that fall within the scope of this document.

1.1.2 Application

This document constitutes a means of conformance to AS 3645 for LP Gas portable and mobile appliances.

This document may be applied, as far as is reasonable, to appliances not mentioned in the scope, and to gas appliances designed on new principles or technologies.

Appliances other than hand-held heating tools shall conform to the requirements of [Sections 2, 3, 4](#) and [5](#), and to the requirements of the following Sections according to the type of the appliance:

- (a) Cookers: [Section 6](#).
- (b) Heaters: [Section 7](#).
- (c) Barbecues: [Section 8](#).
- (d) Water heaters: [Section 9](#).
- (e) Gas lights: [Section 10](#).

Hand-held heating tools shall conform to the requirements of [Section 11](#).

1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 1357.1, *Valves primarily for use in heated water systems, Part 1: Protection valves*

AS 2136, *Method for detecting the susceptibility of copper and its alloys to stress corrosion cracking using the mercurous nitrate test*

AS/NZS 1596, *The storage and handling of LP Gas*

AS/NZS 1869, *Hose and hose assemblies for liquefied petroleum gases (LP Gas), natural gas and town gas*

AS/NZS 4020, *Testing of products for use in contact with drinking water*

UL 147, *Standard for Hand-Held Torches for Fuel Gases*

ISO 6957, *Copper alloys — Ammonia test for stress corrosion resistance*

1.3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

1.3.1

ambient temperature

temperature of the air surrounding the appliance, as measured by a dry bulb thermometer or equivalent

1.3.2

barbecue

underfired cooking appliance with either an open grid or solid cooking top

Note 1 to entry: The food is cooked by a combination of radiant and convective heat and may be assisted by flared fat.

1.3.3

burner

device that positions a flame in the desired location by delivering gas and air to that location in such a manner that continuous combustion is accomplished

1.3.3.1

hotplate burner

burner on a cooking appliance intended to heat vessels placed on a pan support

1.3.3.2

main burner

burner designed to fulfil a thermal function of the appliance

Note 1 to entry: Main burners are also referred to as “burner” throughout this document.

1.3.3.3

ring burner

burner consisting of one or more concentric rings or ports with an integral pan support and gas control(s)

1.3.4

burner port

opening in a burner through which gas or an air/gas mixture issues to be ignited and burned

1.3.5

cartridge

1.3.5.1

gas cartridge

non-refillable container with a capacity from 50 mL to 1 000 mL fitted with a gas release control device and filled with gas or a mixture of gases for fuelling portable gas appliances

Note 1 to entry: These cartridges are equivalent to UN 1950 in the *Australian Dangerous Goods Code*.

Note 2 to entry: Refer also to EN 417 or JIS S 2148.

1.3.5.2

pierceable gas cartridge

non-refillable gas container without a gas release control device

Note 1 to entry: The gas supply is obtained by piercing the cartridge by means of a specific device which is an integral part of the portable appliance with which the cartridge is to be used.

Note 2 to entry: These cartridges are equivalent to UN 2037 in the *Australian Dangerous Goods Code*.

1.3.6

CO/CO₂ ratio

ratio by volume of carbon monoxide to that of carbon dioxide in the combustion products

Note 1 to entry: This is a measure indicative of combustion performance.

1.3.7

control

device designed to change the operation of the appliance or component

Note 1 to entry: Examples of controls include valves and thermostats.

1.3.8**cooking device**

device supplied with the appliance designed to hold or receive the food to be cooked

Note 1 to entry: Examples of cooking devices are grid, turnspit and baking tray.

1.3.9**cooking grid**

cooking device consisting of a grate or mesh designed to hold the food to be cooked through a combination of radiant heat and convection

1.3.10**cylinder**

container that falls within the scope of AS 2030.1 or, in New Zealand, an approved container as relevant to NZLPG

1.3.11**detachable**

that which can be dismantled without using a tool

1.3.12**enclosed cartridge**

gas cartridge that is —

- (a) directly connected to the appliance; and
- (b) contained within the appliance

1.3.13**flame abnormality**

flame condition that results in spitting, sputtering, lifting or floating flames, lighting back, extinction, yellow tipping, carbon deposition, objectionable odour and undue noise

Note 1 to entry: If the length of the yellow tipping is less than 20 % of the total length of the flame on visual inspection, it is not considered to be “appreciable” yellow tipping.

1.3.14**flame safeguard**

safety device that automatically cuts off the gas supply if the actuating flame is not detected

1.3.15**flame lift**

separation of a flame from a burner port, whilst continuing to burn with its base some distance from the port

1.3.16**flueway**

port or passageway conveying flue gases within the appliance

1.3.17**flueway terminal**

device fitted to the exit of an appliance flueway on a flueless appliance

1.3.18**gas circuit**

pipe work and components between the gas supply inlet and the injector

1.3.19**gas consumption**

rate at which energy is introduced into an appliance under specified conditions

Note 1 to entry: Gas consumption is usually expressed in megajoules per hour or grams per hour.

1.3.20**gas container**

any container for the storage of gas

Note 1 to entry: This includes cartridges, cylinders and integral gas storage means.

1.3.21**gas manifold**

gas supply pipe or chamber with multiple points to supply gas

1.3.22**griddle plate**

solid plate heated from below which is used to cook food directly on its surface

1.3.23**grill**

part of an appliance for cooking food by radiant heat

1.3.24**gripping area**

part of a handle designed to be gripped in normal use

1.3.25**hand-held heating tool**

hand-held device that generates heat through combustion of LP Gas using atmospheric oxygen without mechanical pressurized assistance

Note 1 to entry: Examples of hand-held heating tools include blowlamps, hand-held brazing torches, hot air guns for heat shrinking or paint stripping, and laboratory burners.

1.3.26**hood**

cover which provides a chamber above the cooking grid(s) of a barbecue which enables the barbecue to be used as an oven

1.3.27**hose assembly**

flexible hose including end fitting connecting the gas supply to the appliance inlet

Note 1 to entry: Hose assemblies in accordance with AS/NZS 1869 may include other components (e.g. regulator).

1.3.28**hotplate**

part of an appliance with one or more burners that heat by direct flame the bases of the cooking vessels

1.3.29**injector**

device that causes air to mix with a stream of gas

Note 1 to entry: In the case of an aerated burner the injector incorporates an orifice discharging gas into the mixing throat or tube.

1.3.30**injector orifice**

precise aperture in an injector that functions as a metering device to control the gas consumption of a burner

Note 1 to entry: An injector orifice is also a directional guide for the gas injected into the throat of an aerated burner.

1.3.31**integral container**

gas container that is not intended to be disconnected for refilling

1.3.32**LP Gas****liquefied petroleum gas**

hydrocarbon fluid composed predominantly of any of the following hydrocarbons, or mixtures of all or any of them: propane (C_3H_8), propylene (C_3H_6), butane (C_4H_{10}) or butylene (C_4H_8)

1.3.33**light back**

transfer of the flame from the burner tip or port back into the body of the burner or back to the injector

1.3.34**maximum working water pressure**

pressure setting of the water pressure relief valve, or its equivalent

1.3.35**mixing tube**

part of an atmospheric burner in which the air and gas are mixed

1.3.36**mobile appliance**

appliance with one or more wheels, designed to be easily moved from place to place by one person

1.3.37**nominal gas consumption**

gas consumption as stated in the manufacturer's specifications, instructions, in general communications and on the appliance

1.3.38**nominal test point pressure**

specified gas pressure at which the appliance is designed to operate, and which is measured at a test point

1.3.39**normal pressure**

<appliances supplied with gas from a refillable container and using a regulator> nominated gas pressure at the appliance inlet or test point (if provided), that gives the nominal gas consumption

1.3.40**outdoor**

above ground, open-air situation with natural ventilation, without stagnant areas, where gas leakage and products of combustion are rapidly dispersed by wind and natural ventilation and convection

Note 1 to entry: [Appendix D](#) provides diagrammatical representations of outdoor areas.

1.3.41**oven**

portion of a gas cooker or separate unit consisting of an enclosed, insulated cabinet in which food is cooked

1.3.42**overload gas consumption**

<appliances supplied with gas from a refillable container and using a regulator> gas consumption that results when gas at 1.25 times normal pressure is supplied to the appliance inlet

1.3.43**overload gas consumption**

<vapour pressure appliances> gas consumption that results when gas at a pressure equivalent to vapour pressure at 40 °C ambient is supplied to the gas manifold at the inlet of the burner injector orifice

1.3.44**oxygen depletion system**

system which causes the gas supply to be shut off when the oxygen content of the ambient air is depleted to a specified concentration

1.3.45**pan support**

support placed above a hotplate burner and designed to support the vessel to be heated

1.3.46**pilot**

permanently located burner, independent of the main burner and small in relation to it, arranged to provide ignition for the main burner

1.3.47**portable appliance**

appliance designed to be carried by hand from place to place, as required

1.3.48**regulator**

device that automatically regulates the outlet pressure or the outlet volume of gas passing through it to a predetermined value

1.3.49**removable**

intended to be removed with or without the use of a tool

1.3.50**safety shut off valve**

automatic valve used to shut off gas supply to an appliance when a signal is generated indicating the approach to an unsafe condition

1.3.51**soft solder**

solder for which the lowest temperature of the melting range, after application, is less than 450 °C

1.3.52**spitting**

flame phenomena where the escape of non-evaporated liquefied gas produces a shower of burning liquid droplets that separate from the main flame

1.3.53**standard test vessels**

vessels of the dimensions specified in [Figures A.5](#) and [A.6](#)

1.3.54**sustained self-ignition**

propagation of a flame by other than deliberate manual operation, such as by dropping the appliance, so as to cause the ignition system to be activated and the flame to continue to burn

1.3.55**Universal LP Gas appliance**

appliance intended for use with propane, butane or any mixture of propane and butane

1.3.56**valve**

device for the purpose of controlling or shutting off flow

1.3.57**vapour pressure appliance**

appliance supplied with gas where the pressure at the inlet of the appliance is equal to the pressure in the gas container

Note 1 to entry: If the appliance is fixed directly to the gas cylinder by a rigid connection, or if the gas container is incorporated as part of the appliance, the appliance inlet is the part of the connection that takes the gas from the cylinder.

Note 2 to entry: If the appliance is connected to the gas container by a flexible hose, the pressure in the flexible hose, once it is connected to the gas container, is equal to the pressure in the gas container.

1.3.58**water heater**

appliance that is designed to heat and supply water at a temperature not exceeding 99 °C for drinking and/or sanitary purposes

1.3.58.1**unvented water heater**

water heater having no provision for a vent permanently open between the water circuit and atmosphere

1.3.58.2**vented water heater**

water heater having provision for a vent permanently open between the water circuit and atmosphere

1.4 Test methods

The following test methods are referred to in this document and are located in [Appendix B](#).

- B.1 Gas leakage — Fully assembled appliances
- B.2 Gas consumption test
- B.3 Holding time of thermoelectric flame safeguard test
- B.4 Shut off time for safety shut off system test
- B.5 Determination of CO/CO₂ ratio in combustion products of surface combustion burners
- B.6 Determination of CO/CO₂ ratio in combustion products
- B.7 Flame characteristics at maximum and minimum limiting conditions
- B.8 Burner ignition at maximum and minimum limiting conditions
- B.9 Delayed ignition
- B.10 Reignition at turndown under draught conditions
- B.11 Burner operation — Unburnt gas release from burner system
- B.12 Temperature hazards
- B.13 Heat resistance
- B.14 Heat resistance — Light back condition

B.15	Zinc-based alloy
B.16	Marking
B.17	Needle valves — Resistance to temperature
B.18	Needle valves — Durability
B.19	Stability test for freestanding appliances
B.20	Displacement test
B.21	Spillover
B.22	Pan stability test
B.23	Overpressure protection
B.24	Gas cartridge temperature safety
B.25	Drop test — Cookers and heaters with enclosed cartridge
B.26	Operation of oxygen depletion system — Heaters with gas consumption in excess of 6 MJ/h
B.27	Vitiation
B.28	Integrity of the primary guard
B.29	Ignition of draped fabric test
B.30	Resistance of glass components to impact
B.31	Tip over switch test
B.32	Glass components — Resistance to mechanical shock
B.33	Glass components — Resistance to thermal shock
B.34	Operation of relief device of unvented water heaters containing less than one litre of water
B.35	Outlet water temperature
B.36	Maximum water temperature
B.37	Wind test
B.38	Hydrostatic strength test
B.39	Rain and shower water resistance
B.40	Resistance to spitting
B.41	Burning behaviour
B.42	Drop test — Hand-held tools

Section 2 Design and construction requirements

2.1 Scope

This section specifies the requirements necessary to design, construct and present an LP Gas appliance that conforms to AS 3645.

2.2 General design requirements

2.2.1 Portable appliances

Portable appliances shall weigh not more than 20 kg. Where an appliance is directly attached to a gas container, this weight limitation shall apply to the combined system, with the gas container full.

2.2.2 Mobile appliances

All mobile appliances shall provide adequate support for an associated gas container and operate only from the associated gas container.

2.2.3 Adequacy of means of support

Appliances shall be provided with adequate means of support, which shall allow the appliance to remain stable on the intended supporting surface and shall not have sharp edges in contact with the supporting surface.

If the appliance is fitted with a foldable support, it shall be possible to lock this in the position of use.

The valve on a gas container shall not be used as a means of support where the appliance has a maximum horizontal dimension exceeding 300 mm.

2.2.4 Displacement of parts

The construction of an appliance shall be such that, during normal conditions of use, any displacement of parts likely to impair safe operation does not occur.

2.2.5 Gas manifolds

Gas manifolds shall be firmly fixed to prevent their displacement during handling or use.

2.2.6 Sharp edges

Parts likely to be contacted by the service person, assembler or user shall not have sharp points or edges. Where the appliance may be connected by a flexible hose, a hose of length indicated in the instructions shall not come into contact with sharp edges.

2.2.7 Wheels

Wheels allowing the movement of the appliance shall —

- (a) adequately support the appliance and, if applicable, any full container specified in the instructions; and
- (b) be provided with means to prevent accidental movement during use.

2.2.8 Cooking grids

2.2.8.1 General

Any cooking grids shall be detachable.

2.2.8.2 Grid with a rigid useful area

Where a cooking grid is fitted, in the useful area of the grid the minor dimension of any opening shall not exceed 20 mm.

2.2.8.3 Radiant stop

If the radiant device of a barbecue or a grill can have several positions, a stop shall be provided for each of them.

2.3 Materials

2.3.1 Jointing

Jointing compounds and jointing materials shall be of a type demonstrated as suitable for the conditions of use. Refer to AS 4623 for information on jointing compounds and jointing materials.

2.3.2 Suitability of materials and finishes

The quality and thickness of the materials used in the construction of an appliance, and the method of assembling the various parts, shall be such that the constructional and performance characteristics do not alter significantly during a reasonable life and under normal conditions of use.

In particular, when the appliance is installed according to accepted practice all components shall withstand the mechanical, chemical and thermal conditions to which they may be subjected in the course of normal operation.

NOTE This requirement does not apply to sacrificial anodes.

2.3.3 Materials containing asbestos

Materials containing asbestos shall not be used.

2.3.4 Materials in contact with gas

Materials in contact with gas shall be suitable for use with LP Gas.

2.3.5 Materials in contact with food

The nature and finish of materials likely to be in contact with food shall be such that they cannot contaminate food.

2.3.6 Brass tubing and fittings

Brass tubing and fittings that come in contact with gas shall not exhibit stress corrosion cracking when tested and examined in accordance with ISO 6957 or AS 2136.

2.3.7 Zinc-based alloys

A zinc-based alloy shall not be used where it may be in contact with water or condensate. Brass is excluded from this requirement.

2.4 Design for assembly

2.4.1 Connection to appliance and gas container

Connection requirements are as follows:

- (a) All gas connections to the appliance and the gas container shall be constructed so that they cannot be accidentally displaced or disconnected and be capable of withstanding normal use and container replacement.
- (b) When the instructions are followed, the connection of the gas container to the appliance shall be readily accomplished, without difficulty and with a minimum of gas leakage.

2.4.2 Appliance connections to non-refillable containers

Appliance connections to non-refillable containers shall —

- (a) conform to an applicable Standard; and
- (b) be compatible with the container to be used with the appliance as nominated in the instruction manual.

2.4.3 Assembly

The entire appliance gas circuit, including the injector, shall be supplied assembled to the point of appliance inlet supply connection.

NOTE This does not include attaching the hose assembly.

2.4.4 Prevention of incorrect assembly

Parts intended to be assembled by the user shall be designed so that the relative position of components will be obvious to the user, and their incorrect assembly will not give rise to any hazardous situation.

It shall not be possible, without using tools, to dismantle parts that are adjusted at the factory, which are not intended to be dismantled by the user and whose dismantling would affect safety.

2.4.5 User adjustment for different gases

The appliances shall not incorporate any adjuster for user adjustment to operate the appliance on a gas different to the appliance specification.

2.5 Design for maintenance

2.5.1 Injectors

Removable gas injectors shall be capable of insertion and removal without damage.

2.5.2 Dismantling and replacement by user

Any dismantling or assembly required by the user following the instructions provided shall be easily carried out without tools or undue force. Any replacement shall not require undue force, and incorrect replacement shall be either impossible or completely obvious.

Where necessary, the following parts shall be readily removable for cleaning and maintenance:

- (a) Burners.
- (b) Mantles and glasses.

- (c) User accessible O-rings.

2.5.3 Cleaning, maintenance and removability of parts by an authorized person

The following parts shall be readily removable for cleaning and maintenance —

- (a) Burner injectors.
- (b) Control valve spindles.
- (c) O-rings, packing and sealing washers.
- (d) Restrictors.

2.5.4 Viewing of burner flames

It shall be possible to view burner flames either directly or by use of a mirror. It is acceptable if this can be achieved by removal of a part of the appliance.

2.5.5 Removable components

Removable components or the threaded parts of the gas circuit which may be dismantled during normal maintenance shall meet the requirements of [Clause 3.4](#) after five disconnections and re-connections in accordance with the instructions.

NOTE Where a gasket is used then replacement of the gasket is permitted.

2.6 Design for operation

2.6.1 Accessibility of controls and working parts

Controls and working parts shall be accessible and easily operated by the user.

2.6.2 Proving of burner ignition

It shall be possible to prove a burner is alight when the appliance is in operation.

2.6.3 Control valve

2.6.3.1 General

Each burner shall have an independent control (valve or device) allowing the opening and closing of its gas supply. For appliances incorporating only one burner, this closing device may be that of the gas container.

Control valves shall —

- (a) incorporate at least two stops: one at the closed position and one at the end of travel;
- (b) be installed in such a way that their strength, operation, manipulation and accessibility undergo no change from actions subjected to in normal use; and
- (c) be mounted in such a way that no accidental movement relative to the gas system is possible.

NOTE For a needle valve the pressure of the needle on its seat constitutes the stop for the closed position.

2.6.3.2 Needle valves

The number of turns of a needle valve knob from the closed to the fully open position shall not exceed six complete turns. The spindle shall not be capable of complete withdrawal from the valve housing during normal operation.

When the valve is in the closed position, no gas pressure shall be exerted on the valve gland.

The closing direction of a needle valve shall be clockwise.

2.6.4 Gas control

It shall be obvious which burner each control supplies.

Controls shall be —

- (a) arranged relative to one another so that the movement of one does not cause inadvertent movement of another control; and
- (b) designed so that control knobs cannot be fitted in the wrong position or move by themselves.

2.6.5 Prevention of injury during ignition

The method of ignition shall be such that it is not necessary for the operator to be exposed to any hazard.

2.7 Controls and safety devices

2.7.1 Adjusting devices

Adjusting devices shall be provided with locking means that shall be sufficiently positive to prevent subsequent movement, either through accident or through the creep of sealing material. The tightening of a locking device shall not alter the setting.

2.7.2 Safety devices and interlocks

Safety devices, interlocks and their associated parts shall be adequately protected and shall not be capable of being inadvertently overridden.

The operation of safety devices shall not be overridden by any other device.

2.7.3 Safety shut off valve bypass

Safety shut off valve(s) shall not be bypassed.

2.8 Gas train

2.8.1 Holes for screws, pins and other fasteners

Holes for screws, pins and other fasteners intended for the assembly of components shall not penetrate the gas circuit.

2.8.2 Soft solder

Soft solder shall not be used to ensure the soundness of the gas circuit. However, it is permitted for internal connections within the gas circuit when they do not involve soundness.

2.8.3 Appliances connected to the gas container by a flexible hose assembly

An appliance connected to the gas container by a flexible hose assembly shall be supplied with a gas hose assembly —

- (a) conforming to AS/NZS 1869; and
- (b) with length no greater than 1 500 mm.

2.8.4 Jointing

Joints shall not depend for their mechanical strength solely upon cement or jointing compounds.

2.8.5 Metal-to-metal joint or joints with seals

Joints that are required to be dismantled during normal maintenance shall not use any product which ensures soundness in the threads.

2.8.6 Compression fittings

Compression fittings on the gas lines shall conform to the following:

- (a) They shall be made to an acceptable standard and mating surfaces shall be compatible.
- (b) Loose olives, where used shall be symmetrical to prevent incorrect assembly.
- (c) Shear olives, where used, may be asymmetrical.
- (d) After making and breaking the fitting 10 times, the joints shall conform to the requirement of [Clause 3.4](#).
- (e) The component parts shall be made of materials with a melting point of not less than 430 °C.

2.9 Burners and ignition systems

2.9.1 Burners and radiant elements

Burners, burner caps and radiant elements shall be designed in such a way that they cannot move inadvertently during use or movement of the appliance.

2.9.2 Burner mixing tubes

Burner mixing tubes shall be positively located and secured in position in relation to gas injectors. Where a mixing tube rests on an injector, provision shall be made to prevent the mixing tube from interfering with the correct functioning of the valve or injector.

2.9.3 Flash lighting systems and cross lighting devices

2.9.3.1 Positive location of flash ignition tubes

Flash ignition tubes shall be positively located in relation to the source of ignition and flame ports to prevent misalignment or rendering of the lighting system inoperative, by normal handling, dismantling or reassembling, or cleaning of the appliance.

2.9.3.2 Cross lighting devices

Cross lighting devices shall be positively located in relation to the source of ignition and flame ports to prevent misalignment or rendering of the cross lighting system inoperative, by normal handling, dismantling or reassembling, or cleaning of the appliance.

2.9.4 Accumulation of unburnt gas

Any enclosure containing at least one burner shall have one or more openings in its lower part allowing the discharge of any unburnt gas released by the burners.

These openings shall not be obstructed when the appliance is in the position of normal use.

2.9.5 Support of pilots, igniters and flame sensing devices

Pilots, igniters and flame sensing devices shall be supported in such a manner that their position relative to each other and the main burner(s) shall remain fixed.

2.10 Components

2.10.1 Safety components

All components relating to the safe operation of the appliance shall conform to the requirements of the relevant component Standard(s) as far as they reasonably apply.

NOTE This includes, but is not limited to, automatic ignition systems, flame safeguards, gas valves, regulators, pressure switches and transducers, whether or not these carry gas.

2.10.2 Limitation of gas flow

Where a supply hose connects an appliance directly to the gas container, a limiting orifice or other means shall be provided to limit the flow of gas immediately after the container to less than 1 kg/h when the cylinder temperature is maintained at 15 °C.

2.11 Gas containers and compartments

2.11.1 Appliances connected directly to a gas cartridge

Appliances designed for direct connection to a cartridge shall —

- (a) be designed to ensure correct alignment and engagement of the cartridge with the appliance connection point;
- (b) be designed so that it is not possible without undue force to install the cartridge in any position other than that which supplies the appliance with gas in the vapour state, with the appliance in its normal operating position; and
- (c) incorporate a manually operated shut off valve.

2.11.2 Appliances directly fitted to a pierceable gas cartridge

When following the instructions, it shall not be reasonably possible to pierce the cartridge unless it is properly secured in the appliance.

The cartridge holder and the piercing device shall —

- (a) be such that the piercing is centred in the position provided; and
- (b) be such that a gas tight seal is made during connection to the container before piercing.

Unless the cartridge is empty it shall not be possible to remove it, without abnormal effort.

2.11.3 Locations and compartments for gas containers

2.11.3.1 Compartments for gas containers

If the appliance has a compartment for a gas container, this compartment shall be designed in such a way that —

- (a) effective ventilation is provided by openings in its lower and upper section. The total area of the openings in the upper section shall be at least equal to 1 % of the base area of the compartment and the total area of the openings at the lower level at least equal to 2 % of the base area of the compartment;
- (b) the gas container can be easily inserted, or removed from the compartment and when in place the container shall be firmly fixed in accordance with manufacturer's instructions; and
- (c) the gas container valve, if any, is readily accessible and remains easy to manipulate when the gas container is in place.

2.11.3.2 Support for a gas container

Where the appliance has provision to support a gas container —

- (a) the appliance shall incorporate a device allowing the safe fixing of the container onto the appliance; and
- (b) the support for the gas container shall have sufficient mechanical strength to resist permanent distortion under the load of a full gas container.

2.11.4 Gas containers supplied with the appliance

Any gas container supplied with the appliance shall conform to an applicable Standard.

2.12 Markings

2.12.1 Language

Markings required by this document shall be in English. Where markings are also provided in languages other than English, the contents in all languages shall be consistent with the requirements of this document.

2.12.2 Appliance markings

NOTE 1 Other marking requirements (e.g. wiring diagrams, identification of certification body and certificate number) may be applicable to a product that falls within the scope of this document.

Appliances shall be provided with clear markings that are readily accessible and easy to read. Such markings shall include the following:

- (a) Model designation.
- (b) Name, trade mark or identification mark of the manufacturer or responsible vendor.
- (c) Month and year of manufacture or serial number where this is documented to show month and year of manufacture.
- (d) Total nominal gas consumption in megajoules per hour (MJ/h) and/or grams per hour (g/h).
- (e) The type of the gas container(s) intended to be used with the appliance, in the form: "This appliance shall only be used with a <type of gas>, <type of container>, certified to <Standard XYZ>".

where:

< type of gas > = Butane, propane, butane/propane mix (including percentage of each gas in mix).

< type of container > = Gas cartridge or refillable container.

< Standard XYZ > = The Standard to which the container must be certified.

NOTE 2 An example of this marking is as follows:

“This appliance shall only be used with a 70 % butane/30 % propane mix gas cartridge certified to EN 417.”

(f) The warning, “IT MAY BE HAZARDOUS TO ATTEMPT TO FIT OTHER TYPES OF GAS CONTAINERS” immediately after the information shown in (e).

(g) The following text:

(A) For all types of appliances:

ONLY USE IN WELL-VENTILATED AREAS.

CARBON MONOXIDE HAZARD — USING THIS APPLIANCE IN AN ENCLOSED SPACE MAY CAUSE DEATH. DO NOT USE IN CARAVANS, TENTS, MARINE CRAFT, CARS, MOBILE HOMES OR SIMILAR LOCATIONS.

(B) Additionally for water heaters, heating appliances, barbecues and ring burners:

USE OUTDOORS ONLY. See operating instructions.

CAUTION: ACCESSIBLE PARTS MAY BE VERY HOT. KEEP YOUNG CHILDREN AWAY.

NOTE 3 For appliances where it is impractical to mark the appliance directly, a swing tag is acceptable.

All information from Items (a) to (g) shall be permanently marked on the appliance, unless it is impractical to do so, in which case, as a minimum —

- (1) the information of Items (a) and (b) shall be permanently marked on the appliance;
- (2) the information of Items (c), (e) and (f) shall be permanently marked on a swing tag attached to the appliance; and
- (3) the information of Items (d), and (g) shall be included on the packaging and the instructions.

2.12.3 Additional markings

Any additional markings shall not create confusion for the appliance user.

2.12.4 Markings on packaging

Where the markings made in accordance with [Clause 2.12.2](#) (a), (b), (e), (f) and (g) are obscured by the packaging, they shall be reproduced clearly on the packaging.

No information on the packaging shall conflict with the safety markings on the appliance or the instructions.

2.12.5 Marking of control valves

2.12.5.1 Plug type control valves

The closed, open, and reduced rate positions shall be permanently marked in a visible location adjacent to the valve.

The closed position shall be marked by the word “OFF”, a full disc, or an open circle at least 3 mm in diameter. The “OFF” markings shall be the same for all the control valves.

The open and reduced rate positions shall be indicated through symbols other than letters. These symbols shall not give rise to any possibility of confusion with the identification of an “OFF” position.

NOTE Examples of symbols suitable for marking plug type control valves include —

(a)	Full rate position	Large flame	
(b)	Reduced rate position	Small flame	
(c)	Rate range	Triangle	
		or	
		Scale	1234
		or	4321

2.12.5.2 Needle valves

The closing direction of a needle valve shall be permanently marked in a visible location adjacent to the valve.

The closing direction shall be indicated with an arrow (stylised is acceptable) and the tip shall point to either the word “OFF”, a full disc or an open circle at least 3 mm in diameter, or the mark “-” symbolizing the closed position.

NOTE 1 Examples of symbols suitable for marking needle type control valves:



NOTE 2 The markings are not required to mark the reduced rate position.

2.12.6 Identification of injectors

Injectors shall carry an identifying cipher. The cipher shall be in the form of numerals indicating the orifice size in millimetres or the drill size number. A colour coding is acceptable. Alternatively the injector size may be marked on the appliance.

2.13 Instructions

2.13.1 Language

Instructions required by this document shall be in English. Where instructions are also provided in languages other than English, the contents in all languages shall be consistent with the requirements of this document.

2.13.2 Instructions supplied with appliance

2.13.2.1 General

Instructions for the user shall be supplied with each appliance, covering each separate function of the appliance including the dismantling, cleaning and assembly that is necessary.

2.13.2.2 Information about the appliance

The instructions supplied with the appliance shall include the following:

- (a) Model of appliance.
- (b) The statement in bold, “Important. Read these instructions for use carefully. Familiarise yourself with the appliance before connecting it to its gas container. Keep these instructions for future reference.”
- (c) The nominal gas consumption for each burner in megajoules per hour and/or grams per hour.
- (d) The type of the gas container(s) intended to be used with the appliance, in the form: “This appliance shall only be used with a <type of gas>, <type of container>, certified to <Standard XYZ>”.

where:

< type of gas > = Butane, propane, butane/propane mix (including percentage of each gas in mix).

< type of container > = Gas cartridge or refillable container.

< Standard XYZ > = The Standard to which the container must be certified.

NOTE An example of this instruction is as follows: “This appliance shall only be used with a 70 % butane/30 % propane mix gas cartridge certified to EN 417.”

- (e) The warning, “IT MAY BE HAZARDOUS TO ATTEMPT TO FIT OTHER TYPES OF GAS CONTAINERS” immediately after the information shown in (d).
- (f) The following text:
 - (i) For all types of appliances:
ONLY USE IN WELL-VENTILATED AREAS.
CARBON MONOXIDE HAZARD — USING THIS APPLIANCE IN AN ENCLOSED SPACE MAY CAUSE DEATH. DO NOT USE IN CARAVANS, TENTS, MARINE CRAFT, CARS, MOBILE HOMES OR SIMILAR LOCATIONS.
 - (ii) Additionally for water heaters, heating appliances, barbecues and ring burners:
CAUTION: ACCESSIBLE PARTS MAY BE VERY HOT. KEEP YOUNG CHILDREN AWAY.
USE OUTDOORS ONLY.
“This appliance shall only be used in an above ground open air situation with natural ventilation, without stagnant areas, where gas leakage and products of combustion are rapidly dispersed by wind and natural convection.”
“Any enclosure in which the appliance is used shall comply with one of the following:
(A) An enclosure with walls on all sides, but with no overhead cover.

- (B) Within a partial enclosure that includes an overhead cover and no more than two walls.
- (C) Within a partial enclosure that includes an overhead cover and more than two walls, the following shall apply:
 - (1) At least 25 % of the total wall area is completely open.
 - (2) 30 % or more in total of the remaining wall side, back and front wall areas is open and unrestricted.
 - (3) In the case of balconies, 20 % or more of the total wall area shall remain open and unrestricted."
- (g) For heating appliances, water heaters and barbecues, the diagrams in [Appendix D](#).
- (h) The injector sizes.
- (i) Details of the methods of connection for gas, water and alternatives where applicable.
- (j) A statement that the appliance shall be used away from flammable materials and information on minimum distances from adjacent combustible surfaces (e.g. wall, ceiling).
- (k) Reference to removal of any transit protection.
- (l) Special conditions that must be avoided, e.g. marine environments, and any conditions necessary to ensure optimum performance.
- (m) Information regarding the location of any combustion air openings and a caution against obstructing these openings.
- (n) Details of necessary testing, and instructions for minor adjustments.
- (o) For an appliance with direct rigid connection to the gas container, diagrams and specifications of the gas containers (including their gas outlet connections) intended for the gas supply to the appliance.
- (p) For appliances supplied by a cylinder, the largest recommended cylinder size.
- (q) A statement that the appliance is not suitable for installation or connection to a reticulated gas supply.

2.13.2.3 Safety information, abnormal operation, maintenance schedule, service and replacement parts

The instructions supplied with the appliance shall —

- (a) assist the user to recognize abnormal operation which requires service;
- (b) recommend a maintenance schedule for the life expectancy of the appliance;
- (c) include information for general maintenance and repairs;
- (d) include the text, "Do not modify this appliance";
- (e) include a reference as to where service and any necessary replacement parts may be obtained;
- (f) include details for the removal, cleaning, and replacement of devices (e.g. spider guards) that are used over primary air openings;
- (g) include details for cleaning any injector(s) where relevant;

- (h) include a drawing showing the position of seals replaceable by the user and clear instructions on how to replace them, if applicable;
- (i) where applicable, contain the statement, “Check that seals between the appliance and the gas container are in place and in good condition before connecting the gas container.”;
- (j) include the statement, “Do not use this appliance if it has damaged or worn seals.”;
- (k) include the statement, “Do not use this appliance if it is leaking, damaged or does not operate properly.”;
- (l) include a statement that the appliance is to be operated on a horizontal surface unless it is designed to be suspended during operation;
- (m) include a statement that gas containers shall be changed in a well-ventilated location, preferably outside away from people and any sources of ignition, such as naked flames, pilot flames, electric heaters/equipment;
- (n) include the following:
 - (i) For appliances for use with cartridges —
 - (A) specific instructions on how to isolate the gas supply in the event of a leak (smell of gas); and
 - (B) the statement, “If there is a leak from your appliance (smell of gas) and you cannot stop the gas flow, remove the appliance to a well-ventilated location away from any ignition source. Check for leaks using soapy water. Do not try to detect leaks using a flame.”
 - (ii) For appliances for use with cylinders, the statement —
“If there is a leak on your appliance (smell of gas), immediately attempt to turn off the cylinder valve. Remove the appliance to a well-ventilated location away from any ignition source. Check for leaks using soapy water. Do not try to detect leaks using a flame.”
- (o) for appliances supplied with a hose assembly, include the statement, “Only use the hose assembly as supplied with this appliance for connection to the cylinder — DO NOT USE ADAPTORS.”; and
- (p) include the statement, “This appliance must only be serviced by an authorized person.”

2.13.2.4 Information for use

The instructions supplied with the appliance shall include the following information:

- (a) How to operate the appliance safely.
- (b) How to store the appliance when it is not in use including, where applicable, the disconnection and sealing of the cylinder.
- (c) Information on storing cylinders outdoors in a well-ventilated area out of the reach of children. Any indoor storage information shall be consistent with AS/NZS 1596.
- (d) How to adjust the burner setting and the meaning of the symbols used for the various adjustment positions, including the information required by [Clause 2.12.5.1](#) or [Clause 2.12.5.2](#), as applicable.
- (e) A warning not to move the appliance during operation; unless the appliance is designed specifically to allow movement while operating.

- (f) For appliances with flexible hoses —
 - (i) the maximum hose length to be used;
 - (ii) where applicable a statement such as, “After use, turn the gas cylinder valve off, wait for the flame to go out, then turn the appliance control valve(s) off.”; and
 - (iii) the text, “Avoid twisting or kinking the flexible hose.”
- (g) How to check if the gas container is empty.

2.13.2.5 Information for appliances with pierceable cartridges

For appliances with pierceable cartridges, the instructions supplied with the appliance shall include the following information:

- (a) Full details on how to connect and disconnect the pierceable cartridge safely.
- (b) The statements:
 - (i) “Check that burners are extinguished before disconnecting the gas container.”
 - (ii) “Check that the gas container is empty before removing it.”
 - (iii) “Change the gas container outside and away from people.”
 - (iv) “Check the seals visually before connecting a new gas container to the appliance.”

2.13.3 Assembly

Appliances that are supplied in kit form shall, in addition to any other instruction required by this document, be provided with assembly instructions that include, as a minimum, the following:

- (a) Model of appliance.
- (b) List of tools necessary for assembly.
- (c) List of parts, including nuts, bolts, screws, washers, etc. with illustrated means of identification.
- (d) Step-by-step instructions of the assembly of the relevant components, including which nuts, bolts, washers are to be used, with sufficient text and/or illustrations to ensure correct assembly.
- (e) Detailed instructions of any adjustment that may be necessary.
- (f) Complete instructions for testing for leakage.

Section 3 Preliminary tests

3.1 Test gases

3.1.1 Appliances operating from a cylinder or refillable container

The test gases used in this document are defined in the Test Gas [Table 3.1](#) and are based on pure components. Actual test gases are made up using constituent test gases of the purities listed below to the respective Wobbe index $\pm 2\%$. Purities of the constituent gases are to be not less than —

- (a) 95 % for propane ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$);
- (b) 95 % for propylene ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$); and
- (c) 95 % for butane ($H_2 + CO + O_2 < 1\%$, $N_2 + CO_2 < 2\%$).

Where base gases of the required composition or purity are not readily available, suitable blended gases of the same Wobbe index and other combustion characteristics may be used. In case of dispute, the purity of the constituent gases shall not be less than the above values.

NOTE See [Appendix E](#) for background to the test gas pressures used.

Tests in this document shall be carried out using the gases specified in [Tables 3.2\(A\)](#), [3.2\(B\)](#) and [3.2\(C\)](#) as applicable for the specified test conditions (see [Table 3.1](#) for test gas characteristics).

Universal LP Gas appliances shall be tested with test gas “X” for all normal test conditions testing except for [Clause 5.4](#) (temperature hazards) and [Clause 5.5](#) (heat resistance) where test gas “Y” shall be used. Nominal gas consumption shall be rated on test gas “X” and this is the figure that is to be marked on the appliance.

3.1.2 Appliances operating from a non-refillable container

Appliances for use with a non-refillable container shall be tested with the filled container supplied by the manufacturer.

The composition of the gas in the container shall be stated and the testing shall be carried out based on the stated composition.

Table 3.1 — Test gas

Test gas	Application	Composition %						Characteristics ^a				
		Hydrogen	Methane	Propane	Propylene	Butane	Nitrogen	Air	Specific energy MJ/kg	Heating value MJ/ m ³	Relative density	Wobbe index MJ/ m ³
X	LP Gas	—	—	100	—	—	—	—	50.4	95.8	1.553	76.9
Y		—	—	—	—	100	—	—	49.5	125.7	2.078	87.2
Z		—	—	—	100	—	—	—	—	88.5	1.476	72.9
^a The reference conditions for the characteristics are 15 °C, 101.325 kPa, dry. The test gases shall be of a composition and of combustion characteristics as shown in the table. Where base gases of the required combustion purity are not available, suitably blended gases of the same Wobbe index and other combustion characteristics may be used. In case of dispute gases strictly shown in the Table shall be used.												
NOTE The listed characteristics for test gas “Y” are based on the properties of iso-butane.												

3.2 Test conditions

3.2.1 Appliances intended for use with non-refillable containers

Appliances intended for use with non-refillable containers shall be tested with a gas container temperature/equivalent vapour pressure maintained throughout the test at 15 °C to simulate normal test conditions gas pressure, 40 °C to simulate overload test conditions and 5 °C to simulate underload test conditions. The temperature of the gas container shall be maintained at these temperatures for the duration of the test.

NOTE This may be achieved by supplying a gas mixture at an equivalent pressure.

3.2.2 Appliances intended for use with refillable containers

For appliances supplied with gas from a refillable container and not using a regulator, test gases shall be supplied at the appliance inlet at the test pressures shown in the relevant methods of test.

Adjustments shall be made with the test gas that is applicable with the inlet pressure set at the applicable test gas pressure as shown in [Tables 3.2\(A\), 3.2\(B\) or 3.2\(C\)](#).

Table 3.2(A) — Normal test conditions gas pressure

Gas		Pressure kPa
Propane	X (propane)	630
Butane	Y (butane)	110
Universal LP Gas	X (propane)	630
	Y (butane)	110

Table 3.2(B) — Overload test conditions gas pressure

Gas		Pressure kPa
Propane	X (propane)	1 250
Butane	Y (butane)	400
Universal LP Gas	X (propane)	1 250
	Y (butane)	400

Table 3.2(C) — Underload test conditions gas pressure

Gas		Pressure kPa
Propane	X (propane)	400
	Z (propylene)	500
Butane	Y (butane)	50
Universal LP Gas	Y (butane)	50
	Z (propylene)	500

NOTE Underload pressure is approximately equal to the vapour pressure at 0 °C.

3.2.3 Appliances supplied with gas from a refillable container and using a regulator

Appliances supplied with gas from a refillable container and using a regulator shall be tested at the following limiting conditions applied to the burner manifold/injector orifice:

- (a) Normal test conditions pressure is the nominal test point pressure which results when the gas supply pressure is maintained at conditions defined in [Table 3.2\(A\)](#).
- (b) Overload test conditions pressure is $1.25 \times$ nominal test point pressure or the highest test point pressure which occurs when the gas supply pressure is varied between conditions defined in [Tables 3.2\(B\)](#) and [3.2\(C\)](#), whichever value is the greater.
- (c) Underload test conditions pressure is $0.75 \times$ nominal test point pressure or the lowest test point pressure which occurs when the gas supply pressure is varied between conditions defined in [Tables 3.2\(B\)](#) and [3.2\(C\)](#), whichever value is the lesser.

3.3 Preparation for testing

3.3.1 Initial test order

The leakage test shall be the first test performed in any test program.

Where the overpressure protection test is required, this test shall be carried out before any other testing, other than the leakage test.

3.3.2 Setting up an appliance for testing

The appliance shall be set up in accordance with the manufacturer's instructions unless otherwise specified in this document

All services (e.g. gas, electricity, water etc.) shall be connected.

The appliance shall be examined to ensure that it does not have any structural, mechanical or operational defects.

The gas consumption, aeration, temperature settings and other adjustments shall be checked to ensure they have been made in accordance with the manufacturer's recommendations. Adjustments shall be made with the test gas that is applicable with the inlet pressure set at normal test conditions.

All panels, covers and doors shall be in the fitted position during testing.

3.3.3 Appliance regulators not to be removed during testing

Appliance regulators are an integral part of the appliance and shall not be removed during tests, unless specifically instructed otherwise.

3.3.4 Protection from accidental draughts

The appliance under test shall be protected from accidental draughts.

3.3.5 Prevention of gas rate variation

Provision shall be made to prevent thermostats, or any other variable restriction in the gas line, from varying during tests unless otherwise specified in this document.

3.4 Gas leakage

When tested in accordance with Test Method B.1, the leakage rate shall not exceed 1 mL/min under the following conditions:

- (a) When parts of the fully assembled gas train that are exposed to unregulated pressure, including the connection to the gas container, are subjected to a pressure of:
 - (i) 2 600 kPa, for propane and Universal LP Gas appliance; or
 - (ii) 1 000 kPa, for butane appliance.
- (b) For appliances incorporating an overpressure safety device, when the fully assembled gas train is subjected to any inlet gas pressures up to the activation of the safety device.
- (c) For appliances that are subjected to regulated pressure, when parts of the appliance that are exposed to regulated pressure are subjected to the greater of 14 kPa or twice the pressure specified in [Clause 3.2.3\(b\)](#).

Hoses and connections shall not leak after a force of 150 N is applied for 1 min along the axis of the flexible hose.

3.5 Gas consumption

The determined gas consumption of each independently controlled burner shall be within the following tolerance when tested in accordance with Test Method B.2:

- (a) 20 % of nominal gas consumption for burners with input less than 2 MJ/h.
- (b) 15 % of nominal gas consumption for burners with input 2 MJ/h or above but less than 12 MJ/h.
- (c) 10 % of nominal gas consumption for burners with input 12 MJ/h or above but less than 30 MJ/h.
- (d) 5 % of nominal gas consumption for burners with input 30 MJ/h or above.

NOTE Universal LP Gas appliances are tested using propane.

3.6 Ignition and safety shut off systems

Flame safeguards shall conform to the following:

- (a) Flame failure of a burner supervised by a flame safeguard shall result in safety shut down.
- (b) When tested in accordance with Test Method B.3, on carrying out the normal lighting procedure on a manually ignited atmospheric burner protected by a thermoelectric flame safeguard system, the flame safeguard shall hold open within 20 s of igniting the operating flame.
- (c) When tested in accordance with Test Method B.4, the combined time for the safety shut off system and its associated valves to shut off the gas supply in the event of flame failure at the point of supervision shall not exceed 60 s.

Section 4 Test under limiting conditions

4.1 Sooting

During testing, there shall be no deposit of soot that is likely to impair safe operation of the appliance.

4.2 CO/CO₂ ratio limits for any independent surface combustion burner — Underload

When tested in accordance with Test Method B.5, the CO/CO₂ ratio of the combustion products of any independent surface combustion burner, of an appliance operating at the underload test conditions specified in [Clause 3.2](#), when operated at the lowest possible input setting, shall not exceed —

- (a) 0.007 after 10 min, for heaters and gas lights;
- (b) 0.02 after 10 min, for any other appliance.

4.3 CO/CO₂ ratio limits for any independent burner — Normal

When tested in accordance with Test Method B.6, the CO/CO₂ ratio of the combustion products of any independent burner, of an appliance operating at the normal test conditions specified in [Clause 3.2](#), shall not exceed —

- (a) 0.002 after 10 min, for heaters and gas lights;
- (b) 0.01 after 10 min, for any other appliance.

4.4 CO/CO₂ ratio limits for independent burner — Overload

When tested in accordance with Test Method B.6, the CO/CO₂ ratio of the combustion products of any independent burner, of an appliance operating at the overload test conditions specified in [Clause 3.2](#), shall not exceed —

- (a) 0.007 after 10 min, for heaters and gas lights;
- (b) 0.02 after 10 min, for any other appliance.

4.5 Flame characteristics at maximum and minimum limiting conditions

When tested in accordance with Test Method B.7 an appliance burner shall exhibit no flame abnormality, at normal, overload and underload test conditions specified in [Clause 3.2](#), whether the appliance is hot or cold.

4.6 Burner ignition at maximum and minimum limiting conditions

When the normal lighting procedure is followed and the appliance is tested in accordance with Test Method B.8, each burner shall ignite completely and quietly within 5 s for all gases, at overload and underload test conditions specified in [Clause 3.2](#) when the appliance is hot and cold. The time shall be measured from the first flow of gas.

There shall be no extinction or light back. A slight tendency to lift is permitted at maximum test pressures provided that no parts of the flame are extinguished.

For a burner not protected by a flame safeguard, the gas shall light smoothly when it is turned on while another burner is already operating within the same enclosure.

4.7 Delayed ignition

When tested in accordance with Test Method B.9 and the ignition of a manually ignited burner has been delayed for 10 s, or for 5 s in the case of a burner fitted with a flame safeguard, the burner shall at normal test conditions as specified in [Clause 3.2](#) —

- (a) ignite completely;
- (b) remain alight;
- (c) not light back;
- (d) not burn outside the appliance;
- (e) not extinguish any other burner at any setting; and
- (f) not damage the appliance.

4.8 Reignition at turndown under draught conditions

When a burner is tested in accordance with Test Method B.10, using normal test conditions as specified in [Clause 3.2](#) and the appliance is subjected to an 8 km/h draught, complete reignition of the gas shall occur when the draught is removed or the appliance shall shut down safely.

For appliances with turndown, the burner is set to the marked turndown setting or to 25 % of nominal gas consumption where no marked setting has been provided.

For appliances without turndown the burner is operated at nominal gas consumption.

4.9 Burner stability when changing setting

Burners shall not light back or be extinguished when turned normally from full-on to turndown position, or from the turndown to full-on position, when operated at normal test conditions as specified in [Clause 3.2](#).

The turndown position is —

- (a) the marked or fixed turndown position; or
- (b) 25 % of nominal gas consumption where there is no marked or fixed position.

4.10 Unburnt gas release from burner system

When tested in accordance with Test Method B.11 at underload test conditions as specified in [Clause 3.2](#), unburnt gases shall not spill from any part of the burner system except for the burner ports.

Section 5 Performance specifications

5.1 Condensate

Appliances shall be designed so that under normal operating conditions, no condensate shall escape from the appliance. Condensate, where present, shall not interfere with combustion.

5.2 Temperature hazards

5.2.1 General

Testing for all requirements in this [Clause 5.2](#), excluding [Clause 5.2.6](#), shall be in accordance with Test Method B.12.

5.2.2 Floor, wall, overhead and bench surfaces

The temperatures of floor, wall, overhead and bench surfaces shall not exceed 65 °C above ambient, when set up in accordance with the manufacturer's instructions and both with and without any special conditions as indicated by a permanent marking on the appliance. This includes all adjacent surfaces and overhangs.

5.2.3 Surfaces intended to be handled

The temperature rise above ambient for surfaces intended to be handled, except those parts that are located in an area where they are obviously hot, shall not exceed —

- (a) 35 °C for metals;
- (b) 45 °C for porcelain or vitreous enamel; or
- (c) 60 °C for plastics, timber or equivalent materials.

Where the surface is coated, the temperature rise limits of the supporting material shall apply for —

- (i) Any plastic coating less than 0.3 mm; and
- (ii) Any metal coating less than 0.1 mm.

NOTE Parts in this category include control knobs, control valve handles, push buttons, carry and door handles (gripping area only).

5.2.4 Temperatures of surfaces likely to be accidentally touched

The temperature rise above ambient for surfaces likely to be accidentally touched, excluding working surfaces and surfaces within 25 mm of a working surface, shall not exceed —

- (a) 80 °C for metals;
- (b) 95 °C for vitreous enamelled steel, glass and similar surfaces; or
- (c) 100 °C for plastics, timber or equivalent materials.

NOTE 1 Working surfaces include the following:

- (a) Pan supports.
- (b) Cooking surfaces.
- (c) Radiant surfaces.
- (d) Barbecue covers.

NOTE 2 Surfaces likely to be accidentally touched include the following:

- (a) Control panel fascia.
- (b) Side panels.
- (c) Panels adjacent to door handles.
- (d) Parts of doors that are accessible when the door is closed.

5.2.5 Temperatures of components

5.2.5.1 Bodies of gas valves, thermostats, etc

The corrected temperature of controls and safety devices shall not exceed the maximum continuous service temperature specified by the component manufacturer.

5.2.5.2 Components containing non-metallic diaphragms

Temperatures of components containing non-metallic diaphragms shall not exceed 45 °C above ambient, unless specified for use at higher temperatures and so marked permanently.

5.2.5.3 Components containing zinc-based alloys

Where failure of a zinc-based alloy may affect safe operation of the appliance, the temperature of the alloy shall not exceed 50 °C above ambient.

5.2.5.4 Flexible hoses

The corrected temperatures of flexible hoses shall not exceed the maximum temperature for that class of hose. When moved reasonably the hose shall not come into contact with surfaces where the corrected temperature exceeds the temperature rating of the hose.

5.2.5.5 Joints sealed with jointing materials

The corrected temperatures of joints sealed with jointing materials shall not exceed the specified maximum temperature of the materials, under the conditions of use.

5.2.5.6 Glass components

The corrected temperature of glass components shall not exceed the specified maximum temperature of the glass.

5.2.5.7 Gas container

The temperature of the container shall not exceed ambient.

5.2.5.8 Copper tubing

The temperature of copper tubing used upstream of the injector shall not exceed 50 °C above ambient.

5.2.6 Gas container safety at overload gas consumption

With the exception of appliances covered by [Clause 6.4](#), when an appliance is operated at overload test conditions as specified in [Clause 3.2](#):

- (a) The vapour pressure within the gas container shall not exceed the maximum working pressure for which the gas container has been specified or approved.

- (b) The temperature of the container shall not exceed the following:
 - (i) For cartridges, ambient temperature.
 - (ii) For other gas containers, 20 °C above ambient.

5.3 Heat resistance of appliance

5.3.1 Normal operation

After operation in accordance with Test Method B.13, the appliance shall function normally and satisfy the following —

- (a) surface finishes shall show no signs of deterioration, other than discoloration of burner caps and portable lamp caps;
- (b) there shall be no deterioration that could impair safe operation of the appliance; and
- (c) the ease of changing the gas container and of operating the controls shall not have changed.

5.3.2 Light back operation

For any burner in which a light back condition can be established, the materials of the burner shall not melt or distort, and there shall be no damage to the appliance or overheating of the gas container when it is operated for 1 h at the maximum gas rate at which the light back condition can be maintained, but at no more than the nominal gas consumption, in accordance with Test Method B.14.

5.4 Durability

5.4.1 Zinc-based alloys

Where failure of zinc-based alloys may affect the safe operation of the appliance the alloy shall not swell, crumble or develop cracks when tested in accordance with Test Method B.15.

5.4.2 Durability of permanent markings

When tested in accordance with Test Method B.16, a marking that is required to be permanent shall —

- (a) remain legible; and
- (b) show no signs of becoming detached from the surface to which it is applied.

5.4.3 Needle valves — Gas leakage

A needle valve shall:

- (a) When tested in accordance with Test Method B.17, have a leakage rate not exceeding 0.05 L/h with the valve both open (injector sealed) and closed.
- (b) When tested in accordance with Test Method B.18, have a leakage rate not exceeding 0.05 L/h after 2 000 cycles.

Needle valves conforming to the relevant requirements of EN 521:2006 are deemed to conform to this requirement.

5.5 Strength and stability

5.5.1 Stability

When tested in accordance with Test Method B.19, an appliance designed to rest on a table or on the ground shall not tip over when it is inclined up to an angle of 15° in any direction and any gas container shall not be dislodged. Any parts that are attached to a gas container to achieve stability shall be omitted for this test.

This requirement shall also be met when the appliance is fitted with optional parts (e.g. lamp extension posts).

5.5.2 Gas systems — Resistance to displacement from vibration

When tested in accordance with Test Method B.20 the relative position of components in the gas system shall be retained when subject to disassembly and reassembly.

5.5.3 Cooking grid strength

Any cooking grid shall be capable of withstanding, without deterioration likely to impair its use, an evenly distributed load of 5 g/cm² of useful area. Under this load, it shall remain stable on its supports.